SOIL SURVEY

Queen Annes County, Maryland

OUR SOIL ★ OUR STRENGTH

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
MARYLAND AGRICULTURAL EXPERIMENT STATION
Issued September 1966

Major fieldwork for this survey was done in the period 1942–1961. Soil names and descriptions were approved in 1964. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1964. This survey of Queen Annes County was made as part of the technical assistance furnished by the Soil Conservation Service to the Queen Annes Soil Conservation District.

HOW TO USE THIS SOIL SURVEY REPORT

THIS SOIL SURVEY of Queen Annes County, Md., contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in appraising the value of tracts of land for agriculture, industry, or recreation.

Locating Soils

All the soils of Queen Annes County are shown on the detailed map at the back of this report. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with numbers shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbol. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in the report. This guide lists all of the soils of the county in alphabetic order by map symbol. It shows the page where each kind of soil is described, and also the page for the capability unit, drainage group, irrigation group, and woodland group in which the soil has been placed.

Individual colored maps showing the relative suitability or limitations of soils for many specific purposes can be developed by using the soil map and information in the text. Interpretations not included in the text can be developed by grouping the soils according to their suitability or limitations for a particular use. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils in the soil descriptions and in the discussions of the section describing the soils and the section that discusses management of soils for cultivated crops and pasture.

Foresters and others can refer to the subsection "Woodland," where the soils of the county are grouped according to their suitability for trees.

Game managers, sportsmen, and others concerned with wildlife will find information about soils and wildlife in the subsection "Wildlife."

Community planners and others concerned with suburban development can read about the soil properties that affect the choice of homesites, industrial sites, schools, and parks in the subsection "Nonfarm Uses of Soils."

Engineers and builders will find under "Engineering Uses of Soils" tables that give engineering descriptions of the soils in the county and that name soil features that affect engineering practices and structures.

Scientists and others can read about how the soils were formed and how they are classified in the section "Formation and Classification of Soils."

Students, teachers, and others will find information about soils and their management in various parts of the text, depending on their particular interest.

Newcomers in Queen Annes County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "General Nature of the County," which gives additional information.

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NOTICE TO LIBRARIANS

Series year and series number are no longer shown on soil surveys. See explanation on the next page.

Issued September 1966

EXPLANATION

Series Year and Series Number

Series year and number were dropped from all soil surveys sent to the printer after December 31, 1965. Many surveys, however, were then at such advanced stage of printing that it was not feasible to remove series year and number. Consequently, the last issues bearing series year and number will be as follows:

- Series 1957, No. 23, Las Vegas-Eldorado Area, Nev.
- Series 1958, No. 34, Grand Traverse County, Mich.
- Series 1959, No. 42, Judith Basin Area, Mont.
- Series 1960, No. 31 Elbert County, Colo. (Eastern part)
- Series 1961, No. 42, Camden County, N.J.
- Series 1962, No. 13, Chicot County, Ark.
- Series 1963, No. 1, Tippah County, Miss.

Series numbers will be consecutive in each series year, up to and including the numbers shown in the foregoing list. The soil survey for Tippah County, Miss., will be the last to have a series year and series number.

SOIL SURVEY OF QUEEN ANNES COUNTY, MARYLAND

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SOIL CONSERVATION SERVICE

SURVEY BY JOHN R. ARNO, F. G. GLADWIN, RICHARD I. HALL, F. Z. HUTTON, SR., L. W. ILGEN, L. E. LINDLEY, J. E. McCUEN, WILLIAM U. REYBOLD, III, AND JOHN J. STILWELL, JR., SOIL CONSERVATION SERVICE, UNITED STATES DEPARTMENT OF AGRICULTURE

UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION WITH MARYLAND AGRICULTURAL EXPERIMENT STATION

QUEEN ANNES COUNTY is in eastern Maryland, in the north-central part of the peninsula called the Eastern Shore (fig. 1). The county occupies 238,720 acres, or 373 square miles. Centreville, the largest town and the county seat, is in the approximate center of the county and is at the head of navigation of the tidal Corsica River, an arm of the Chester River. Smaller towns are Stevensville, Church Hill, Grasonville, Queen Anne, and Queenstown.

Settlement of the county began before the middle of the 17th century. Most of the colonists came from England, but some were religious refugees from New England and Virginia who came to the State because of the Maryland Toleration Act of 1649. Settlement was mainly on or near navigable rivers or Chesapeake Bay, for travel and transportation were mainly by water. The county was organized in 1706. In 1960 it had a population of 16,569 that was fairly evenly distributed except in the extreme eastern part, which is more sparsely populated.

About 94 percent of the land area in the county has soils that are suitable for cultivation. An additional 5 percent consists of soils that are not well suited to cultivated crops but that can be used as woodland or, to some extent, for growing forage for livestock. The small remaining acreage is made up of marshes and beaches that are not suitable for farming.

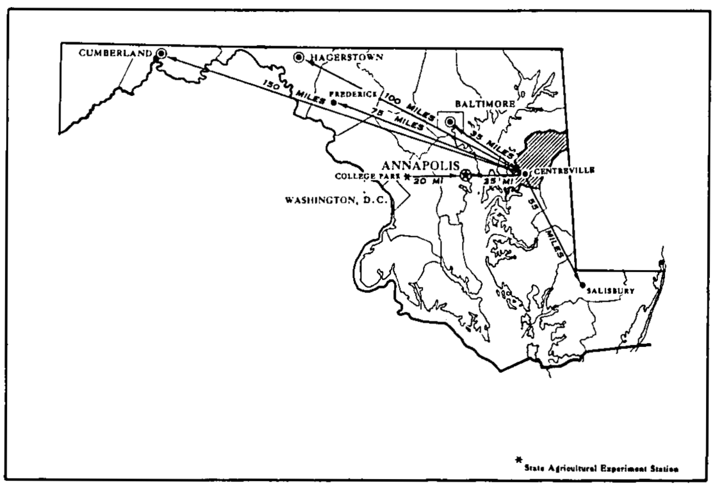

Figure 1.—**Location of Queen Annes County in Maryland.**

About 60 percent of the acreage suitable for cultivation consists of soils that need artificial drainage before they can be used extensively for agriculture. Some of these soils need intensive drainage before they can be cropped. About 44 percent of the acreage suitable for cultivation is subject to erosion, but the hazard is severe only in rather small areas. Some areas subject to erosion also need draining. Only about 4 percent of the acreage suited to cultivated crops consists of soils that need no special management practices.

The climate is favorable for general farming, for raising poultry, and for growing truck crops, small fruits, and orchard fruits. It is suited to forest trees and is favorable for lumbering.

Areas of marsh are not extensive, but they attract large numbers of migratory waterfowl. Opportunities for hunting and fishing attract many sportsmen to the county. Urban areas are not extensive, but some large residential areas are being developed, particularly on Kent Island and other areas along the waterfront.

General Nature of the County

This section gives information about the physiography, relief, and drainage of the county. It also describes the climate and the vegetation and discusses industry, transportation and markets, and agriculture.

Physiography, Relief, and Drainage

Queen Annes County lies on the Atlantic Coastal Plain. Its acreage is partly on the mainland and partly on islands, mainly Kent and Wye Islands. Kent Island is in the Chesapeake Bay and is separated from the mainland by Kent Narrows. Wye Island is separated from the mainland by the Wye River, the Wye East River, and Wye Narrows.

TABLE 1.—*Temperature and*

[Elevation

Month	Temperature						Average heating degree-days
	Average daily maximum	Average daily minimum	Average monthly extremes		Extremes		
			Highest	Lowest	Highest	Lowest	
	°F.	°F.	°F.	°F.	°F.	°F.	
January	44	27	64	8	77	−13	920
February	46	26	64	9	76	−12	810
March	54	33	74	17	90	3	670
April	66	42	84	28	91	22	330
May	75	52	89	37	96	28	90
June	83	61	95	47	101	38	10
July	87	66	97	54	105	47	0
August	85	64	95	51	103	44	0
September	80	57	93	40	100	31	40
October	69	46	85	29	93	22	240
November	58	36	74	16	88	5	530
December	46	27	64	10	73	−1	870
Year	66	45	98	3	105	−13	4,510

[1] Less than one-half day. [2] Less than one-half inch.

The western part of the county is a low, almost level plain that is less than 20 feet above sea level in most places and is barely above high tide near Kent Narrows. This part of the county runs west of a line between Queenstown and the eastern tip of Wye Island and includes both Wye Island and Kent Island. Few streams dissect the surface of this plain, but small bays branching off from Chesapeake Bay indent the shores and create many narrow peninsulas, locally known as necks. Waves and tides are cutting away parts of the shoreline and are causing the shore to erode.

Except for narrow areas along the Chester River and the Wye East River and major tributaries, the rest of the county is more than 20 feet above sea level. Along the Chester River from Queenstown to Wilmers Point are many necks, or peninsulas, that have an elevation of more than 20 feet. In many places these necks have distinct bluffs that drop off rather sharply to the water.

That part of the county having an elevation of more than 20 feet consists of an upland plain that is mostly very gently sloping but in places is moderately rolling. The plain is well dissected and, in most places, has good surface drainage. Most of its soils are well or moderately well drained, though many small areas are more poorly drained. To the east and south of Peters Corners is a small area adjoining Kent County, Del., that is nearly level, is marked by a number of depressions, and has an average elevation of about 70 feet. This area is wet, in some places is swampy, and is very poorly drained. It heads many small streams that flow into Maryland and Delaware.

The highest point in the county is about 1 mile northwest of Starr and is 87 feet above sea level. From this point, the county is drained in three directions. Most of it is drained west and south to the Wye East River. North and west of a triangle formed by connecting Starr, Barclay, and Cleaves Forks, drainage is northeast toward the Delaware line and eventually into the Chester River. The eastern part of the county is drained by small streams that flow into Tuckahoe Creek, a main tributary of the Choptank River. Surface drainage is entirely within the Chesapeake Bay watershed.

Climate [1]

Queen Annes County has a humid, temperate, semicontinental climate. Winter is usually mild, and summer is very warm and moist. Spring and fall are the most pleasant seasons.

Because most weather systems in this temperate region move in an easterly direction, the influence of the Atlantic Ocean is slight. Alternating high and low pressure systems usually dominate or control the climate of the county. High pressure systems sweep in generally from the west or northwest and are preceded by a front that brings rain or snow according to the season and the temperature. After the front passes, drying winds blow from the northwest. As the high passes over Queen Annes County, the wind normally shifts to the south or southwest and brings in warmer, moist air that remains until the next front passes.

Low-pressure systems generally arrive from the southwest or west, along frontal lines. If a low passes to the north of Queen Annes County, precipitation is likely to be scanty. If it passes to the south, however, winds move counterclockwise and bring in much moist air from the South Atlantic or the Gulf of Mexico. As a result, precipitation occurs as warm rain in summer and as cold rain or wet snow in winter. The most severe winter storms generally are of this type.

[1] This section was prepared chiefly by A. DELBERT PETERSON, State climatologist for Maryland and Delaware, Weather Bureau, U.S. Department of Commerce.

precipitation at Millington, Md.

30 feet]

Precipitation					Average number of days with—				
		Snow, sleet, or hail			Precipitation of—			Temperature	
Average	Daily maximum	Average	Monthly maximum	Daily maximum	0. 10 inches or more	0. 50 inches or more	Snowfall 1 inch or more	Maximum 90° and higher	Minimum of 32° and lower
Inches	*Inches*	*Inches*	*Inches*	*Inches*				*°F.*	*°F.*
3. 7	2. 51	6	25	16	7	2	2	0	22
2. 9	1. 70	6	25	15	6	2	2	0	21
3. 9	3. 50	3	21	9	8	3	1	0	17
3. 3	2. 33	1	15	15	7	2	(1)	(1)	4
3. 9	2. 36	0	0	0	7	3	0	1	(1)
3. 2	4. 84	0	0	0	6	2	0	6	0
4. 2	3. 14	0	0	0	7	3	0	10	0
4. 9	5. 84	0	0	0	7	3	0	7	0
3. 6	4. 95	0	0	0	5	2	0	3	(1)
3. 0	2. 24	(2)	3	3	5	2	(1)	(1)	3
3. 5	5. 82	(2)	10	6	6	2	(1)	0	12
3. 1	2. 66	4	26	18	6	2	1	0	22
43. 2	5. 84	21	46	18	77	28	6	27	101

The Appalachian Mountains and the waters of Chesapeake Bay moderate the cold air from the northwest, but they have much less effect on air from the south or southwest.

Table 1 shows, by monthly averages, climatic data recorded at Millington, just across the county line in Kent County, Md., during the 30-year period of 1931–60. These data are representative of Queen Annes County. The temperature in the county is similar to that at Millington, but near the shore of Chesapeake Bay, the temperature early in the morning is slightly warmer and on a summer afternoon is slightly cooler. The hottest period is late in July, when the maximum afternoon temperature averages 88° F. The coldest period, on the average, is early in February, when the minimum temperature is about 25°. The highest temperature normally expected in summer is 96°, though 105° was recorded in July 1936. The lowest temperature recorded at Millington was —13° on January 28, 1935, but the lowest in Queen Annes County normally is 3° to 5° above zero. Table 2 shows the probability of freezing temperatures at Millington on or after given dates in spring and on or before given dates in fall.

Precipitation is fairly evenly distributed throughout the year. Only in July and August does rainfall average more than 4 inches. Rainfall is more variable and less dependable in summer than in winter, and evaporation and water usage are much higher. Local thundershowers are common and may bring as much as 2 or 3 inches of rain in one area, much of the rainwater running off, though areas a few miles away may have only a sprinkle. In winter, precipitation occurs from general storms that cover large areas.

Serious droughts are most likely in summer, though water that falls as rain and that stored in the soil generally are adequate for good crop yields. In some years, however, supplemental irrigation is needed for maximum yields because summer showers are unequally distributed, occasional dry periods occur at a critical stage of plant growth, and the evaporation rate is high in summer.

The annual snowfall ranges from 20 to 25 inches, but it varies from year to year. Only a trace fell in the winter of 1949–50, but 48 inches was measured in 1933–1934. Thunderstorms occur on the average of 30 to 45 days a year, and three-fourths of them are in summer. Hail falls once or twice a year.

Tornadoes are infrequent and ordinarily cause little damage. Hurricanes occur about once a year, usually in August or September. Generally, they cause only minor damage, but once in a while a severe hurricane passes

TABLE 2.—*Probabilities of freezing temperatures in spring and in fall*

[Data from Millington, Kent County, Md.]

Probability	Dates for given probability and temperature		
	16° F. or lower	24° F. or lower	32° F. or lower
Spring:			
1 year in 10 later than	Mar. 12	Apr. 8	May 3
1 year in 5 later than	Mar. 6	Apr. 2	Apr. 28
1 year in 2 later than	Feb. 23	Mar. 22	Apr. 19
4 years in 5 later than	Feb. 11	Mar. 11	Apr. 10
9 years in 10 later than	Feb. 6	Mar. 5	Apr. 5
Fall:			
1 year in 10 earlier than	Nov. 26	Nov. 1	Oct. 8
1 year in 5 earlier than	Dec. 1	Nov. 5	Oct. 12
1 year in 2 earlier than	Dec. 10	Nov. 15	Oct. 21
4 years in 5 earlier than	Dec. 19	Nov. 24	Oct. 29
9 years in 10 earlier than	Dec. 24	Nov. 29	Nov. 3

nearby and causes great damage because it is accompanied by strong winds, heavy rains and the resultant floods, and exceptionally high tides.

The prevailing wind is from the northwest in winter, and from the south or southwest in May through September. The average wind velocity is about 8 to 10 miles per hour, but winds of 50 to 60 miles per hour sometimes accompany severe thunderstorms, hurricanes, or general storms.

The relative humidity is lowest in winter and spring and is highest in summer when tropical air overlies the area much of the time. In the afternoon, humidity generally ranges from 50 to 55 percent in winter and spring and is about 60 percent in summer. Normally, the humidity is highest near sunrise; at this hour it is about 90 percent in summer and 70 to 75 percent in winter and spring.

Vegetation

Queen Annes County was once occupied almost entirely by hardwood trees. Because most of the soils are at least moderately well drained, oaks dominate in the forests, and, in wet areas, they are still extensive. Other important trees in wet areas were red maple, sweetgum, blackgum, holly, bay, dogwood, beech, and birch.

White oak has been especially important in the county, but most of the original stands have been harvested, and the only old trees remaining are some outstanding specimens.

A few loblolly and Virginia pines probably grew in some areas, but they were not numerous until after many areas had been cleared. Virginia pine encroaches in many areas that have been abandoned or heavily cut over, particularly if the soils are coarse textured and tend to be somewhat droughty. Loblolly pine, sometimes known as oldfield pine, encroaches on some soils, particularly those that have impeded drainage. Queen Annes County, however, is at about the northern limit of the natural range of loblolly pine, and extensive or fairly pure stands of this tree are rare. Tidal marsh supports coarse grasses and rushes, and there are a few shrubs and small trees that tolerate salt or brackish water.

Industry

The industries of Queen Annes County are closely related to agriculture and to the natural resources of the area. There are canneries, packinghouses for agricultural products and seafood, and facilities for marketing and distributing fresh fish, oysters, clams, and crabs. The county also has fertilizer plants and outlets for farm machinery and equipment. Lumbering is not so important now as in the past, but income from this source has increased in the last several years.

Transportation and Markets

In colonial days transportation was mainly by water, for all the settlements were on or near Chesapeake Bay or navigable rivers. The waterways are still an important means of transportation, though the economy of the county is no longer entirely dependent on them. Small tankers, grain ships, and other cargo carriers still call at many of the small ports of the Eastern Shore, including those in Queen Annes County.

Modern highways now cross the county in nearly all directions, and there are many paved or hard-surfaced secondary roads. This county is the eastern terminus of the Chesapeake Bay Bridge, which connects Kent Island with the western shore of the bay, near Annapolis. Crossing this bridge are U.S. Highway No. 50, a main route to Ocean City and other points on the Eastern Shore, and U.S. 301, one of the main routes between Florida and the Wilmington-Philadelphia area. Thus, Queen Annes County is easily accessible to markets in Annapolis, Baltimore, Washington, D.C., and all other points west of the bay. Because the bridge is a shortcut to the Atlantic beaches and other resort areas on the Eastern Shore of Maryland and Delaware, traffic is especially heavy on weekends throughout the warmer months.

The county is served by the Centreville Branch (Baltimore and Eastern Railroad) of the Pennsylvania Railroad, and by the Oxford Branch of this railroad, which touches the county at Queen Anne.

Agriculture

This county is particularly favorable for agriculture because the soils respond well to management, the temperate climate provides a fairly long growing season, and rainfall is well distributed. In 1960, there were 812 farms in the county. They occupied a total of 182,772 acres, a decrease of nearly 9 percent since 1950.

Agriculture in the county is fairly well diversified. Most areas are well suited to general farming or to the growing of truck and fruit crops, but some need artificial drainage before they are farmed.

In the following pages is information about farms and farm labor in the county, crops and pasture grown, and livestock and poultry raised. The statistics used are from "Comparative Census of Maryland Agriculture by Counties" (*5*) [2] and from the 1959 Census of Agriculture.

Farms and farm labor

In 1959, the dairy farm was the most common type in Queen Annes County. Other but less numerous types of farms were cash-grain farms, poultry farms, livestock farms, general farms, and vegetable farms. Of the 812 farms, 608 were commercial farms, 110 were part-time farms, and 94 were unclassified.

The average size of farms in 1959 was 225.1 acres. There were 35 farms less than 10 acres in size, 112 farms of 10 to 49 acres, 78 farms of 50 to 99 acres, 511 farms of 100 to 499 acres, and 76 farms of 500 acres or larger. The number of farms having less than 50 acres and those having 500 acres or more increased between 1950 and 1959. However, the majority of farms—those of 50 to 500 acres—decreased sharply in number during the same period, and the average size of farms increased by a little more than 5 percent.

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[2] Italicized numbers in parentheses refer to Literature Cited, p. 116.

Most farms in the county were operated by owners or part-owners in 1959, though 28.3 percent were operated by tenants. Most of the tenants operated on a share basis, but many of them rented the farms they operated.

In this county mechanized equipment is a much more important source of power than horses and mules. Tractors were reported on 738 farms in 1960, but there were only 512 horses and mules in the entire county, and many of the horses were used as mounts instead of work animals. Trucks were reported on 593 farms, grain combines on 305 farms, corn pickers on 335 farms, hay balers on 262 farms, and milking machines on 377 farms.

Crops and pasture

In Queen Annes County crops were harvested on 96,842 acres in 1959. In only two other counties in Maryland, Frederick and Carroll, was a greater acreage harvested. Table 3 gives the acreage of the most important field crops and vegetable crops grown in the county in 1960 and also the number of fruit trees. The most extensively grown crop was corn harvested for grain. This county led the State in 1959 in acres planted to corn and in total bushels of corn harvested, 2,198,436. Other crops, in order of their acreage, were hay, wheat, soybeans, barley, vegetables for sale, oats, and corn for silage or forage.

Fewer acres of vegetable crops were harvested for sale in this county in 1960 than in any other county on the Eastern Shore of Maryland, except for Cecil County, only part of which is on the Shore. The most important vegetable crop in Queen Annes County was sweet corn.

A total of 30,224 acres was pastured in Queen Annes County in 1959, a decrease of 26 percent since 1949. Of this acreage, more than 24,000 acres was cropland used temporarily for pasture. Considering the size of the county, this acreage is small. Except for swine, however, livestock is of minor importance, and little pasture is needed.

TABLE 3.—*Acreage of principal crops and number of fruit trees of all ages in 1960*

Crop	Unit
	Acres
Corn harvested for grain	39, 354
Corn, sweet	2, 949
Corn cut for silage	3, 127
Wheat	15, 141
Barley	5, 729
Oats	3, 439
Rye	1, 035
Soybeans harvested for beans	9, 698
Hay	19, 097
Vegetables harvested for sale [1]	3, 572
Green peas	244
Tomatoes	125
Lima beans	77
Cucumbers	25
Snap beans	3
Strawberries	10
	Number
Peach trees	1, 536
Apples trees	425

[1] Includes sweet corn, melons, cabbage, sweet peppers, asparagus, and spinach.

Livestock and poultry

In general, livestock raising is less important in Queen Annes County than the growing of field crops, especially grain and soybeans. In 1960, there were 24,153 cattle and calves on farms, of which 11,448 were milk cows. Between 1950 and 1960, the number of milk cows decreased sharply, but this decrease was offset by an increase in beef cattle.

In 1960, Queen Annes was second in Maryland in production of hogs and pigs. There were 16,952 on farms, a number that is practically the same as that in 1950. More than 22,000 hogs and pigs were sold alive in 1960. Other livestock in 1960 included 512 horses and mules and 2,343 sheep and lambs.

Poultry is important in Queen Annes County but not so important as in some other counties on the Eastern Shore. Income from the sale of eggs is considerably less than that from the sale of chickens for meat. In 1960 there were only 59,508 mature chickens on farms, yet more than 403,000 chickens were sold because eggs produced locally were hatched mainly for broilers. Only 246,650 dozens of eggs were sold, or only about 4 dozen eggs per mature chicken.

How Soils Are Mapped and Classified

Soil scientists made this survey to learn what kinds of soils are in Queen Annes County, where they are located, and how they can be used. They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. To use this report efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Butlertown and Matapeake, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that go with their behavior in the natural, untouched landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soil series contain soils that differ in texture of their surface layer (*10*). According to such differences

in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Matapeake loam and Matapeake fine sandy loam are two soil types in the Matapeake series. The difference in texture of their surface layers is apparent from their names.

Some soil types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Matapeake loam, 0 to 2 percent slopes, is one of several phases of Matapeake loam, a soil type that ranges from nearly level to moderately sloping.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that greatly help in drawing boundaries accurately. The soil map at the back of this report was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps, the soil scientists have a problem of delineating areas where two or more kinds of soils, generally from two or more series, occur together without regularity in pattern and relative proportions. As a rule, the soils are similar enough in behavior that their separation is not important for the objectives of the survey. Therefore, this group of soils is shown as one mapping unit and is called a group of undifferentiated soils. Ordinarily, such a group is named for the major kinds of soil in it, for example, Bertie and Othello silt loams, 0 to 2 percent slopes. Also, on most soil maps, areas are shown that are so wet, so shallow, or so frequently worked by wind and water that they scarcely can be called soils. These areas are shown on a soil map like other mapping units, but they are given descriptive names, such as Coastal beaches or Tidal marsh, and are called land types rather than soils.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soils. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in a way that it is readily useful to different groups of readers, among them farmers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in the soil survey reports. On the basis of yield and practice tables and other data, the soil scientists set up trial groups, and test them by further study and by consultation with farmers, agronomists, engineers, and others. Then, the scientists adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this report shows, in color, the soil associations in Queen Annes County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

Queen Annes County lies on the Atlantic Coastal Plain. Soil association 1 consists chiefly of excessively or somewhat excessively drained sands and loamy sands. Soil associations 2, 3, and 4 consist mainly of soils that are well drained or moderately well drained, but the soils in association 2 are sandy or loamy and have a sandy clay loam subsoil, whereas those in associations 3 and 4 are silty and have a silty clay loam to plastic clay subsoil. Most of the soils in soil associations 5 and 6 are poorly or very poorly drained.

1. Galestown-Lakeland-Downer association: Somewhat excessively or excessively drained sands and loamy sands

In this soil association are broad areas of nearly level and sloping soils that generally are the most sandy in the county. About equal acreages of these soils are on slopes of less than 2 percent and of 2 to 5 percent. Small areas are steeper. Most of the association has been cleared and is used for crops or homesites, but small areas remain wooded. Scrub hardwoods and Virginia pine make up most of the native plant cover. Virginia pine is especially abundant in heavily cutover areas and in second-growth stands.

This association occurs as a narrow band along the Chester River in the northern part of the county. It extends northeastward from Primrose Point, just south of Kings Town, to a point opposite Millington in Kent County. It occupies only about 4,800 acres, or 2 percent of the county.

The association consists mainly of the Galestown, Lakeland, and Downer soils in about equal acreages. The Galestown and Lakeland soils are somewhat excessively or excessively drained sands and loamy sands that, in

most places, are underlain by a clayey, water-bearing substratum at a depth of 4 to 6 feet. Galestown soils are brown, and Lakeland soils are yellow to brownish yellow. The Downer soils have a loamy sand surface layer that is similar to the one in the Galestown soils. It is commonly 18 to 24 inches thick and is underlain by a subsoil of dark-brown sandy loam. Below the subsoil is sand or loamy sand.

Also, in the association are small areas of the moderately well drained Klej soils and the poorly drained Plummer and Fallsington soils. Drainage is needed on these sandy soils, particularly the Plummer and Fallsington soils, before they can be used for some crops.

The major soils of this association are fairly low in productivity and in capacity to hold moisture available to plants. Nevertheless, a large part of the association is used for corn, soybeans, and other field crops. The soils generally are well suited to practically all crops grown in the county, but full production can be obtained only by applying liberal amounts of fertilizer and manure, by protecting the soils from wind and water erosion, and by using other practices of intensive management.

Except in steeper areas, the Galestown and Lakeland soils have few characteristics that limit their use for residential developments or for disposing of sewage effluent from septic tanks. These soils make desirable homesites; most areas are on or near a beautiful tidal river.

2. Sassafras-Woodstown association: Well drained and moderately well drained soils that have a friable sandy clay loam subsoil

This soil association consists mainly of nearly level to rolling fields, pastures, and some wooded areas. Most of the association is on slopes of 2 to 5 percent, though some of it has slopes of less than 2 percent, and many small areas are on slopes of 5 to more than 30 percent. The natural vegetation is made up chiefly of upland oaks, but other hardwoods are fairly common, and there are some stands of loblolly and Virginia pines.

The association occupies areas that are scattered throughout nearly all of the county. It occurs on Kent Island, along the shores of Eastern Bay, and in many small to medium-sized areas in the southern and eastern parts of the county from Wye Island to Wye Mills, eastward to Queen Anne, then northeastward to the Delaware line. The major part of the association occurs in a large, fairly continuous area that extends from the vicinity of Centreville to Church Hill, McGinnes, and the northeastern corner of the county. It is the largest association in Queen Annes County and occupies more than 110,000 acres, or 46 percent of the total area.

Of the major soils in the association, Sassafras soils account for about three-fourths of the acreage, and Woodstown soils make up the rest. The Sassafras soils are deep and well drained. They have a surface layer of friable loam or sandy loam and a thick subsoil of strong-brown to yellowish-red or reddish-brown, friable sandy clay loam.

The Woodstown soils generally are less sloping than the Sassafras soils and are not so well drained. They have slopes of less than 2 percent in about three-fifths of their acreage and are on slopes exceeding 5 percent in only a few small spots. Woodstown soils developed on the same kind of material as Sassafras soils and have a surface layer of sandy loam or loam. Their subsoil consists of sandy clay loam that is yellowish brown in the upper part and is mottled grayish brown and light yellowish brown in the lower part.

Also, in the association are areas of the poorly drained Fallsington soils and spots of the very sandy Galestown or Lakeland soils. In addition, there is a small acreage of other soils.

The Sassafras and Woodstown soils are only moderate in natural fertility, but they respond well to good management, especially to fertilizer and manure. If they are carefully managed, they can produce high yields of nearly all crops common in the county, though frost action may damage alfalfa on the Woodstown soils. In managing these soils, the most important problem generally is controlling erosion in sloping areas. During prolonged dry periods, the response to supplemental irrigation is good, particularly on the Sassafras soils.

Except for slope and susceptibility to erosion in small areas, the Sassafras soils have practically no limitations that affect their use. The Woodstown soils, however, are only moderately well drained. They are wet and slow to warm up in spring, and in places they are unsuitable for early planting. Drains are needed in most nearly level areas of Woodstown soils for disposing of excess surface water at planting time and during the early period of crop growth.

In most places there are few limitations affecting the use of Sassafras soils for disposing of sewage effluent from septic tanks, but seepage and downslope pollution are dangers on some of the stronger slopes. Using the Woodstown soils for disposing of sewage effluent from septic tanks is severely restricted because the water table is high in wet periods.

3. Matapeake-Butlertown association: Well drained and moderately well drained silty soils that have a friable to firm silty clay loam subsoil

This soil association is made up chiefly of level to strongly sloping areas of deep, silty soils. About half the association is well drained, and the rest is moderately well drained. Most of the acreage has slopes of less than 5 percent, but some of it is more strongly sloping, and many small areas are on slopes of nearly 30 percent. Although a few areas remain wooded, almost all the association has been cleared and is used for crops. The native trees are mainly upland oaks and other hardwoods, and there are pines scattered through the stands in some areas.

Areas of this association extend from Kent Island to the northeast corner of the county. The most extensive areas occur from near Carmichael School northward to the vicinity of Centreville and westward to near Queenstown; around Hayden, Price, and Clark Corners; west of Ewingville; southwest of Dudley Corners; and from the vicinity of Sudlersville northward to near Hackett Corners. The association has a total area of nearly 44,000 acres, or about 19 percent of the county.

Dominant in the association are the Matapeake and the Butlertown soils. Of these, the Matapeake soils occupy 52 percent of the total acreage, and the Butlertown soils occupy the rest.

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The Butlertown soils formed in thick beds of silt. They have a silt loam surface layer and a yellowish-brown light silty clay loam subsoil that is somewhat compact, firm, and mottled in the lower part. It is light grayish brown below a depth of about 3 feet. Because the subsoil restricts drainage, especially in level and nearly level areas, the soils tend to remain wet and to warm up late in spring.

The Matapeake soils are loams, silt loams, and fine sandy loams. They are similar to the Butlertown soils, but they formed in a somewhat thinner layer of silt, have unrestricted drainage in the subsoil, and are underlain by sandy material at a depth of about 3 feet. In addition, the Matapeake soils commonly contain more fine sand, particularly in the surface layer, than the Butlertown soils.

A small percentage of the association is made up of the well drained Sassafras soils, the moderately well drained Woodstown and Mattapex soils, the somewhat poorly drained Bertie soils, and the poorly drained Othello and Elkton soils. The association also includes small areas of other soils.

Under good management the Matapeake and Butlertown soils probably are the most productive in the county. They are fairly high in natural fertility and very high in available moisture capacity. Consequently, in dry periods crops maintain better growth on these soils than on most others, though they would benefit from supplemental irrigation during periods of drought. The Matapeake and Butlertown soils are well suited to all crops and are susceptible to erosion only on steeper slopes, but in some places the Butlertown soils are slightly limited in use for crops because of impeded drainage. Tiling or ditching is needed on level and mildly sloping Butlertown soils so that excess surface water can be removed in wet periods.

Except in steeper areas, the Matapeake soils have only slight limitations that affect their use for residential developments or for disposing of sewage effluent from septic tanks. The Butlertown soils have slight limitations affecting their use for residential developments, but their use for septic tanks is severely limited because the soils are slowly permeable and are saturated when the water table is high.

4. Mattapex-Keyport association: Moderately well drained silty soils that have a firm silty clay loam to plastic clay subsoil

This soil association is mainly nearly level to moderately sloping. A few areas are steep. Slopes are less than 5 percent in most places, but they range from 0 to nearly 30 percent. Although a large part of the association has been cleared and is farmed, many areas are still wooded. Oaks are dominant in the stands, and hickory, maple, holly, and other water-tolerant trees are common. In some cutover areas, loblolly pine occurs as scattered trees or in nearly pure stands.

Most of the association is on Kent Island, Wye Island, and in areas north and south of Queenstown in the western part of the county. Other areas are northwest of Starr, northwest of Queen Anne, north of Willoughby, and west of Barclay. The association covers about 38,000 acres, or 16 percent of the county.

Dominant in the association are the Mattapex and the Keyport soils. Of these, the Mattapex soils account for about three-fifths of the total acreage, and the Keyport soils make up the rest. All these soils have a yellowish-brown upper subsoil and a mottled olive to olive-brown lower subsoil.

The Mattapex soils have a surface layer of fine sandy loam, silt loam, or loam and a subsoil of silty clay loam that is compact and somewhat platy in the lower part. The Keyport soils have a surface layer of loam, silt loam, or silty clay loam. Their subsoil is clay or fine silty clay that is very firm, very sticky, and very slowly permeable in the lower part. The Mattapex soils are underlain by sandy material at a depth of about 3 feet, whereas the Keyport soils commonly are underlain by heavy clay. In places, however, the material underlying the Keyport soils is somewhat sandy.

Also, in the association are small areas of the well-drained Matapeake soils, the somewhat poorly drained Bertie soils, and the poorly drained Othello and Elkton soils. The association also includes a few acres of other soils, and there are areas of Tidal marsh on and near Kent Narrows between Kent Island and the rest of the county. Tidal marsh provides habitat for wildlife and is important for recreation.

Because the major soils in this association are only moderately well drained, surface drainage must be improved before they can be used for many kinds of crops. If the soils are drained, they are suited to most crops but generally are used for corn, soybeans, pasture, and some hay crops. Alfalfa and other perennial plants may be damaged by frost heaving in winter.

It is fairly easy to drain, work, and manage the Mattapex soils, but it is more difficult to drain and manage the Keyport soils because they are more slowly permeable. Eroded areas of Keyport soils are difficult to plow and cultivate, for most of their crumbly surface layer has been lost through erosion, and plowing brings up part of the heavy clay subsoil. Owing to impeded drainage and slow permeability, the Keyport soils are likely to have excessive runoff and are particularly susceptible to erosion.

The Mattapex and Keyport soils have characteristics that severely limit their use for septic tank disposal fields, and their use for residential developments is moderately restricted. Trees, shrubs, and other plants that require good drainage may not grow normally on these soils. All building sites should be drained by tiling or ditching. Tile lines are satisfactory in the Mattapex soils, but ditches may be necessary in the more slowly permeable Keyport soils. Footings and excavations should be well drained, and basements carefully sealed against penetration of water.

5. Elkton-Othello association: Poorly drained silty soils that have a firm silty clay loam to plastic clay subsoil

Almost all of this soil association is level or nearly level. At least 95 percent of the acreage has slopes of less than 2 percent, and most of the rest is on slopes of 2 to 5 percent. Many parts of the association have been cleared, but woodland is extensive. The natural vegetation is chiefly maple, holly, birch, and water-tolerant oaks, though loblolly pine has invaded some areas of cutover and second-growth woodland, and there are a few pond pines.

The association occurs in areas that are fairly well distributed in all of the county except the extreme northern and northwestern parts. The largest areas are around Hope, near Grasonville, around Roseville, roughly between Barclay and Clark Corners, and about midway between Queenstown and Centreville. Smaller areas are scattered from the southern part of Kent Island to near the Delaware line. The association covers about 31,500 acres, or about 13 percent of the county.

The major soils in the association are Elkton loam, Elkton silt loams, and Othello silt loams. Of these, the Elkton soils occupy about two-thirds of the total acreage, and the Othello soils occupy most of the rest.

All of these soils have a subsoil that is strongly mottled gray, which indicates poor drainage. In the Othello soils the subsoil is light silty clay loam and is underlain by sandy material, whereas in the Elkton soils it is silty clay to clay and is underlain by clay or, in some places, by sandy clay. The subsoil of Elkton soils is more slowly permeable than that of the Othello soils.

The Othello soils are the poorly drained counterparts of the moderately well drained Mattapex soils, and the Elkton soils are the poorly drained counterparts of the moderately well drained Keyport soils. Small areas of the Mattapex and Keyport soils occur in this association.

Also, in the association are small areas of the well-drained Matapeake soils and the very poorly drained Pocomoke, Portsmouth, and Bayboro soils.

The major soils in this association must be drained before they can be cropped extensively. Where the soils are drained, they are suited to many crops but are used mainly for corn and soybeans. Crops that require good drainage do fairly well if the drains are carefully installed and maintained. Tile lines generally function well in the Othello soils, and managing the soils is fairly easy. Ditching is commonly needed in the Elkton soils, however, and management is more difficult because the soils have a finer textured, slowly permeable subsoil. Except in a few spots, erosion is not a serious hazard on the soils of this association.

For disposing of sewage effluent from septic tanks, limitations on the use of these soils are severe. Because the water table is high during much of the year, there would be little or no movement of effluent, particularly in the Elkton soils. Even if drainage and sewage disposal were provided, use of the soils for homesites is limited by subsurface water that would flood basements in wet periods and would injure or kill many kinds of trees, shrubs, and other plants used in landscaping.

6. Fallsington-Pocomoke association: Poorly and very poorly drained soils that have a friable to firm sandy clay loam subsoil

This soil association occupies upland flats and slightly depressional areas. The soils are mainly level or nearly level; in only a few places are slopes as much as 2 percent. Part of the association has been cleared and is used for farming, but some areas remain wet woodland. Red maple, sweetbay, holly, birch, and water-tolerant oaks make up most of the native vegetation, and there are some loblolly and pond pines, particularly in heavily cutover areas.

The largest area of this inextensive association is approximately between Barclay and the Delaware line. Smaller areas are scattered elsewhere in the county, mostly along the Caroline County line. The association covers 4 percent of Queen Annes County, or about 10,500 acres.

Of the major soils in the association, the Fallsington soils occupy slightly more than 80 percent of the total acreage, and the Pocomoke soils make up most of the rest. The poorly drained Fallsington soils have a gray surface layer, and the very poorly drained Pocomoke soils have a black or nearly black surface layer. In all the soils the surface layer is loam or sandy loam, and the subsoil is strongly mottled, friable to firm sandy clay loam that is underlain by much sandier material at a depth of 2 to 3 feet.

Also, in the association are small areas of other soils. Among these are spots of the well drained Sassafras soils and the moderately well drained Woodstown soils, all of which developed in the same kind of sandy and clayey materials. In addition, there is a small acreage of the moderately well drained Klej soils and the poorly drained Plummer soils. The Klej and Plummer soils developed in sandy material. About 2 miles north of Templeville is a fairly large area of Bayboro silt loam, a soil that is very poorly drained like the Pocomoke soils but has a heavy clay subsoil that is very slowly permeable. In places that have not been drained, the Bayboro soil remains swampy much of the year.

Before the soils in this association can be farmed, all but the Sassafras soils must be drained. The Fallsington and Pocomoke soils can be drained fairly easily by either tile or ditches if outlets are adequate. After drainage is improved, the soils are well suited to corn, soybeans, and other crops, and they are easily managed. By keeping the soils fertile, productivity can be maintained at a fairly high level. Erosion normally is not a problem.

Even if they are drained, the soils in this association generally have severe limitations that restrict their use for residential developments and for disposing of sewage effluent from septic tanks. Most buildings constructed in areas of the association are located on knolls, which consist of minor soils that have good drainage but make up only a small part of the total acreage.

Descriptions of the Soils

This section describes the soil series (groups of soils) and single soils (mapping units) of Queen Annes County. The acreage and proportionate extent of each mapping unit are given in table 4.

The procedure in this section is to describe first the soil series, and then the mapping units in that series. Thus, to get full information on any one mapping unit, it is necessary to read the description of that unit and also the description of the soil series to which it belongs. As mentioned in the section "How Soils Are Mapped and Classified," not all mapping units are members of a soil series. Mixed alluvial land, for example, does not belong to a soil series but, nevertheless, is listed in alphabetical order along with the soil series.

Following the name of each mapping unit, there is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of the description of most mapping units are the capability unit and the drainage, irrigation, and woodland suitability groups in which the mapping unit has

TABLE 4.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent	Soil	Acres	Percent
Bayboro silt loam	1, 274	0. 5	Matapeake loam, 5 to 10 percent slopes, moderately eroded	119	0. 1
Bertie and Othello silt loams, 0 to 2 percent slopes	706	. 3	Matapeake loam, 5 to 10 percent slopes, severely eroded	239	. 1
Bertie and Othello silt loams, 2 to 5 percent slopes, moderately eroded	75	(1)	Matapeake silt loam, 0 to 2 percent slopes	1, 199	. 5
Bibb silt loam	337	. 1	Matapeake silt loam, 2 to 5 percent slopes, moderately eroded	2, 198	. 9
Bladen silty clay loam	381	. 2	Matapeake silt loam, 5 to 10 percent slopes, moderately eroded	141	. 1
Butlertown silt loam, 0 to 2 percent slopes	4, 263	1. 8	Matapeake silt loam, 5 to 10 percent slopes, severely eroded	147	. 1
Butlertown silt loam, 2 to 5 percent slopes, moderately eroded	6, 868	2. 9	Matapeake soils, 10 to 15 percent slopes	205	. 1
Butlertown silt loam, 5 to 10 percent slopes, moderately eroded	103	(1)	Matapeake soils, 10 to 15 percent slopes, severely eroded	117	(1)
Butlertown silt loam, 5 to 10 percent slopes, severely eroded	100	(1)	Matapeake soils, 15 to 30 percent slopes	144	. 1
Coastal beaches	242	. 1	Matapeake silt loam, silty substratum, 0 to 2 percent slopes	568	. 2
Downer loamy sand, 0 to 2 percent slopes	388	. 2	Matapeake silt loam, silty substratum, 2 to 5 percent slopes, moderately eroded	2, 972	1. 2
Downer loamy sand, 2 to 5 percent slopes	3, 666	1. 5	Matapeake silt loam, silty substratum, 5 to 10 percent slopes, moderately eroded	279	. 1
Downer loamy sand, 5 to 10 percent slopes	363	. 2	Matapeake silt loam, silty substratum, 5 to 10 percent slopes, severely eroded	87	(1)
Downer loamy sand, 5 to 10 percent slopes, severely eroded	334	. 1	Mattapex fine sandy loam, 0 to 2 percent slopes	224	. 1
Downer loamy sand, 10 to 15 percent slopes	110	(1)	Mattapex fine sandy loam, 2 to 5 percent slopes, moderately eroded	173	. 1
Downer loamy sand, 10 to 15 percent slopes, severely eroded	84	(1)	Mattapex loam, 0 to 2 percent slopes	1, 395	. 6
Downer loamy sand, 15 to 30 percent slopes	83	(1)	Mattapex loam, 2 to 5 percent slopes, moderately eroded	2, 596	1. 1
Elkton loam	1, 228	. 5	Mattapex loam, 5 to 10 percent slopes, moderately eroded	201	. 1
Elkton silt loam, 0 to 2 percent slopes	17, 498	7. 3	Mattapex loam, 5 to 10 percent slopes, severely eroded	247	. 1
Elkton silt loam, 2 to 5 percent slopes, moderately eroded	276	. 1	Mattapex silt loam, 0 to 2 percent slopes	4, 785	2. 0
Fallsington loam, 0 to 2 percent slopes	16, 145	6. 8	Mattapex silt loam, 2 to 5 percent slopes, moderately eroded	3, 479	1. 5
Fallsington loam, 2 to 5 percent slopes	242	. 1	Mattapex silt loam, 5 to 10 percent slopes, moderately eroded	422	. 2
Fallsington sandy loam, 0 to 2 percent slopes	15, 876	6. 7	Mattapex silt loam, 5 to 10 percent slopes, severely eroded	135	. 1
Fallsington sandy loam, 2 to 5 percent slopes	344	. 1	Mattapex soils, 10 to 15 percent slopes	355	. 1
Galestown loamy sand, clayey substratum, 0 to 5 percent slopes	1, 937	. 8	Mattapex soils, 10 to 15 percent slopes, severely eroded	102	(1)
Galestown loamy sand, clayey substratum, 5 to 10 percent slopes	204	. 1	Mattapex soils, 15 to 30 percent slopes	114	(1)
Galestown sand, clayey substratum, 0 to 5 percent slopes	289	. 1	Mixed alluvial land	6, 857	2. 9
Galestown and Lakeland loamy sands, 10 to 15 percent slopes	201	. 1	Othello silt loam, 0 to 2 percent slopes	9, 009	3. 4
Galestown and Lakeland loamy sands, 15 to 30 percent slopes	106	(1)	Othello silt loam, 2 to 5 percent slopes, moderately eroded	697	. 3
Galestown and Lakeland sands, 5 to 10 percent slopes	85	(1)	Othello and Elkton soils, 5 to 10 percent slopes, moderately eroded	122	. 1
Gravel and borrow pits	144	. 1	Plummer loamy sand	90	(1)
Johnston loam	3, 421	1. 4	Pocomoke loam	5, 406	2. 3
Keyport loam, 0 to 2 percent slopes	669	. 3	Pocomoke sandy loam	1, 220	. 5
Keyport loam, 2 to 5 percent slopes, moderately eroded	307	. 1	Portsmouth silt loam	434	. 2
Keyport silt loam, 0 to 2 percent slopes	7, 087	3. 0	Sassafras loam, 0 to 2 percent slopes	3, 842	1 6
Keyport silt loam, 2 to 5 percent slopes, moderately eroded	1, 585	. 7	Sassafras loam, 2 to 5 percent slopes, moderately eroded	9, 864	3. 7
Keyport silty clay loam, 5 to 10 percent slopes, severely eroded	192	. 1	Sassafras loam, 5 to 10 percent slopes, moderately eroded	2, 904	1. 2
Keyport silty clay loam, 10 to 15 percent slopes, severely eroded	81	(1)	Sassafras loam, 5 to 10 percent slopes, severely eroded	497	. 2
Klej loamy sand, 0 to 2 percent slopes	92	(1)	Sassafras loam, 10 to 15 percent slopes, moderately eroded	578	. 2
Klej loamy sand, 2 to 5 percent slopes	118	(1)	Sassafras loam, 10 to 15 percent slopes, severely eroded	161	. 1
Lakeland loamy sand, clayey substratum, 0 to 5 percent slopes	997	. 4	Sassafras loam, 15 to 30 percent slopes	973	. 4
Lakeland loamy sand, clayey substratum, 5 to 10 percent slopes	143	. 1	Sassafras sandy loam, 0 to 2 percent slopes	2, 830	1. 2
Made land	80	(1)	Sassafras sandy loam, 2 to 5 percent slopes, moderately eroded	37, 736	15. 8
Matapeake fine sandy loam, 0 to 2 percent slopes	86	(1)	Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded	4, 769	2. 0
Matapeake fine sandy loam, 2 to 5 percent slopes, moderately eroded	717	. 3	Sassafras sandy loam, 5 to 10 percent slopes, severely eroded	2, 527	1. 1
Matapeake fine sandy loam, 5 to 10 percent slopes, moderately eroded	76	(1)			
Matapeake fine sandy loam, 5 to 10 percent slopes, severely eroded	112	(1)			
Matapeake loam, 0 to 2 percent slopes	493	. 2			
Matapeake loam, 2 to 5 percent slopes, moderately eroded	2, 588	1. 1			

See footnote at end of table.

TABLE 4.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Acres	Percent
Sassafras sandy loam, 10 to 15 percent slopes, moderately eroded	789	0.3
Sassafras sandy loam, 10 to 15 percent slopes, severely eroded	465	.2
Sassafras sandy loam, 15 to 30 percent slopes	1,917	.8
Sassafras sandy loam, 15 to 30 percent slopes, severely eroded	145	.1
Sassafras sandy loam, 30 to 60 percent slopes	140	.1
Swamp	275	.1
Tidal marsh	5,797	2.4
Woodstown loam, 0 to 2 percent slopes	7,886	3.3
Woodstown loam, 2 to 5 percent slopes, moderately eroded	4,458	1.9
Woodstown sandy loam, 0 to 2 percent slopes	5,743	2.4
Woodstown sandy loam, 2 to 5 percent slopes, moderately eroded	4,684	2.0
Woodstown sandy loam, 5 to 10 percent slopes, moderately eroded	183	.1
Woodstown sandy loam, 10 to 15 percent slopes	134	.1
Woodstown sandy loam, 15 to 30 percent slopes	149	.1
Total	238,720	100.0

[1] Less than 0.05 percent.

been placed. The pages on which these groupings are described can be readily found by referring to the "Guide to Mapping Units" at the back of the report.

Soil scientists, engineers, students, and others who want further information about the soils should turn to the section "Formation and Classification of Soils." In the subsection "Detailed Descriptions of Soil Profiles," a profile of a typical soil in each soil series is described in detail.

Many terms used in the soil descriptions and in other sections of the report are defined in the Glossary.

Bayboro Series

The Bayboro series consists of very poorly drained soils that have a thick, black surface layer and a heavy clay subsoil. These soils occupy upland flats and slight depressions, generally at the head of drainageways.

Bayboro soils have a surface layer of black silt loam, about 12 inches thick, that has a high content of organic matter. The upper subsoil is mottled, very dark gray, sticky silty clay. The lower subsoil is plastic, very sticky clay that is a streaky gray mottled with reddish yellow. Water moves through the lower subsoil very slowly. Below a depth of 33 inches is mottled, bluish-gray, firm clay that extends to a depth of 50 inches or more.

The Bayboro soils are very strongly acid or extremely acid unless they have been limed. In some places where they have been cleared, drained, and plowed, the surface layer is dark gray instead of black, especially when dry, and it is somewhat thinner than typical because it tends to shrink or subside if drained and worked.

In many ways the Bayboro soils resemble the Pocomoke and Portsmouth soils, but they are not so sandy as the Pocomoke soils and are not so silty as the Portsmouth soils. In addition, the Bayboro soils have a heavy clay subsoil that is lacking in those soils.

The Bayboro soils are fairly extensive in Queen Annes County. Most of their acreage is in the northeastern part near the Delaware line. The soils are not commonly used for crops, because they are so difficult to drain. Where drainage can be improved, they produce good crops of corn and hay and are suited to soybeans, but most areas are used for grazing or remain as wetland forest.

Bayboro silt loam (Ba).—This is the only Bayboro soil in Queen Annes County. Included with it in mapping are a few areas where the lower subsoil and the substratum contain appreciable amounts of fine and very fine sand.

This soil is difficult to drain and, even if drained, may be difficult to manage. Under good management, however, it can be used for crops, particularly corn and hay or pasture. Because the surface layer has a high content of organic matter, it commonly shrinks or subsides after drainage is improved. (Capability unit IIIw–9; drainage group 9–6B; irrigation group 12; woodland suitability group 1)

Bertie Series

The Bertie series consists of somewhat poorly drained soils. Although they are fairly well drained to a depth of 15 inches, below that depth the subsoil is wet, mottled, and poorly drained.

Both the plow layer and the subsurface layer of these soils are crumbly silt loam, but the plow layer is dark grayish brown and the subsurface layer is light yellowish brown. To a depth of 15 inches the upper subsoil is finer, less crumbly, yellowish-brown silt loam. The lower subsoil is light olive-brown, firm, light silty clay loam that is mottled with brown and light gray, an indication that drainage is poor. Below the subsoil is a wet, sandy substratum between the depths of 34 inches and more than 5 feet.

The Bertie soils are very strongly acid unless they have been limed. In undisturbed wooded areas they have a thin, dark-colored surface layer and a somewhat thicker, lighter colored subsurface layer.

Like the Othello, Portsmouth, Mattapex, and Matapeake soils, the Bertie soils developed in silty material over sand. Bertie soils, however, are better drained than the Othello and Portsmouth soils and are not so well drained as the Mattapex and Matapeake soils.

In this county the Bertie soils are not extensive, and generally they are not clearly defined on the landscape. Because they occur closely with the Othello soils and, in some places, blend into them, they are mapped only in undifferentiated groups of Bertie and Othello silt loams.

Bertie and Othello silt loams, 0 to 2 percent slopes (BoA).—Areas mapped as these soils consist mostly of Bertie silt loam and partly of Othello silt loam. The Othello soil is grayer and wetter than the Bertie soil and is mottled nearer the surface.

Although the Othello soil is more poorly drained than the Bertie soil, the two are commonly used and managed in much the same way. Planting dates are often delayed in wet areas, but where the soils are artificially drained, they are suited to corn, soybeans, and hay and pasture. Erosion is not a hazard. (Capability unit IIIw–1; drainage group 8–1A; irrigation group 13; woodland suitability group 3)

Bertie and Othello silt loams, 2 to 5 percent slopes, moderately eroded (BoB2).—These moderately sloping soils are largely Bertie silt loam, but Othello silt loam makes up some of the acreage. The hazard of further erosion is moderate on these soils, and it influences the kind and spacing of drainage systems on cropland. Included in areas mapped are a few acres that have slopes of slightly more than 5 percent. (Capability unit IIIw–1; drainage group 8–1A; irrigation group 13; woodland suitability group 3)

Bibb Series

The Bibb series consists of poorly drained, gray silty soils on flood plains, or first bottoms, of streams. These soils formed in material that washed from the Matapeake, Butlertown, and other silty soils on uplands.

Undisturbed Bibb soils have a surface layer of very dark gray, crumbly silt loam about 5 inches thick. Their subsurface layer is dark gray mottled with dark yellowish brown and is underlain by about 9 inches of gray silt loam that is mottled with yellowish brown. At a depth of about 37 inches, the substratum generally is heavy, almost black clay that is mottled with brown and light gray.

In cultivated areas the plow layer is dark gray to olive brown. In some places the substratum is gray instead of black, and in places it is sandy or gravelly. The Bibb soils are subject to flooding, and they have a water table near the surface much of the year, especially in undrained areas. Unless they have been limed, the soils are very strongly acid or extremely acid.

The Bibb soils are neither so dark colored nor so poorly drained as the Johnston soils, which also occur on flood plains. In color and drainage the Bibb soils somewhat resemble the Fallsington, Othello, and Elkton soils of the uplands, but they are more uniformly silty above the substratum than those soils, and they show little if any profile development.

In this county Bibb soils occur mainly between Queenstown and Starr. They are inextensive and are not important to the agriculture of the county. If they are drained and protected from flooding, they are suited to crops, particularly corn, hay, and pasture, but most areas are still forested with wetland hardwoods.

Bibb silt loam (Bp).—This is the only Bibb soil in the county. It is level or nearly level and is poorly drained throughout.

If the soil is adequately drained, it is suited to the crops commonly grown in the county, especially corn and soybeans, and to pasture. Many areas support good stands of hardwoods, and there are a few stands of loblolly pine or pond pine. (Capability unit IIIw–7; drainage group 11–A; irrigation group 10; woodland suitability group 2)

Bladen Series

In the Bladen series are poorly drained, fine-textured soils that developed in thick beds of acid clay. In areas of grass meadow, these soils have a dark-gray surface layer and a grayish-brown subsurface layer. Both layers are sticky silty clay loam. The upper subsoil of olive-gray clay and the lower subsoil of gray very firm clay are mottled with light gray, yellow, and brown and are plastic and very sticky. Below a depth of about 44 inches is a substratum of dark-gray, yellow, and olive fine sandy clay that is very plastic and sticky.

In wooded areas the surface layer tends to be thinner and somewhat darker colored than it is in areas of grass meadow. Except in areas that have been limed, the soils are very strongly acid or extremely acid.

The Bladen soils are not so poorly drained as the very dark colored and very wet Bayboro soils. They are similar in some respects to the Elkton soils, but they have a thicker and more prominent, dark-gray surface layer and a finer textured subsoil. Bladen soils are less permeable than the Elkton soils and lack the leached and somewhat bleached subsurface layer of those soils.

In this county the Bladen soils are of limited extent and are not agriculturally important. For the most part, they are not used for crops, but if drained, they would produce some hay or pasture plants. Most areas are idle or remain in wetland hardwoods.

Bladen silty clay loam (Bt).—This is the only Bladen soil in Queen Annes County, and most of it occurs near Grasonville. The soil is level or nearly level, and in some places, is slightly depressional.

Draining this soil is difficult and expensive. Even if drainage is improved, the soil is difficult to work and to manage. The surface layer is most workable when it is moderately moist, though it is firm and tough at that moisture content. But if it is too wet or too dry, it cannot be cultivated at all. For these reasons, the soil generally is not suitable for cultivation. (Capability unit VIw–2; drainage group 8–2A; woodland suitability group 10)

Butlertown Series

The Butlertown series consists of very deep, very silty, moderately well drained soils on uplands. Drainage is not impeded in the upper part of these soils, but a somewhat poorly aerated, compact layer hinders or prevents good drainage below a depth of 30 to 36 inches.

The plow layer of Butlertown soils is dark grayish-brown, crumbly silt loam. It is underlain by an upper subsoil of somewhat sticky, yellowish-brown heavy silt loam or light silty clay loam that extends to a depth of 34 inches. Between the depths of 34 and 49 inches, the lower subsoil consists of compact, brittle, slightly platy heavy silt loam that has abundant mottles of grayish brown or brownish gray. Below the subsoil, to a depth of 5 feet or more, are deposits of yellowish-brown silt. This material is mottled but otherwise is almost unchanged. It generally is underlain by sand.

Although the Butlertown soils are strongly acid unless they have been limed, they are less acid than many other soils in the county. In undisturbed wooded areas the thin, dark-colored surface layer and the yellowish-brown

subsurface layer are crumbly silt loam. In places below a depth of 50 inches, thin streaks of very fine sand occur within the massive silt deposits.

The Butlertown soils are not so well drained as the Matapeake soils, which have developed in the same kind of material but lack the compact layer in the lower subsoil that hinders natural drainage. In some respects the Butlertown soils are similar to the Mattapex soils, but they developed in thicker deposits of silty material and have a more compact lower subsoil.

The Butlertown soils are extensive in Queen Annes County and are important to its agriculture. They occur in scattered but generally fairly large areas, mostly from Wye Neck northeastward to Carville. The Butlertown soils are used intensively for corn, soybeans, small grain, and most hay crops except alfalfa. In places they are used for high-quality pasture.

Butlertown silt loam, 0 to 2 percent slopes (BuA).—This level or nearly level soil is subject to little or no erosion. Below a depth of 30 inches, however, most areas have a firm, brittle, mottled layer that slows internal drainage, and the soil usually is so wet in spring that planting of crops is somewhat delayed. Tile drains or open ditches are needed to remove excess surface water. (Capability unit IIw–1; drainage group 2–A; irrigation group 13; woodland suitability group 11)

Butlertown silt loam, 2 to 5 percent slopes, moderately eroded (BuB2).—Because it is more sloping than Butlertown silt loam, 0 to 2 percent slopes, this soil is more likely to erode if used for cultivated crops. Large areas have already lost an appreciable amount of the surface layer. Included with this soil in mapping are a few severely eroded areas. Needed to control erosion are stripcropping, diversion terraces, and measures for disposing of excess water. (Capability unit IIe–16; drainage group 2–A; irrigation group 13; woodland suitability group 11)

Butlertown silt loam, 5 to 10 percent slopes, moderately eroded (BuC2).—Runoff causes a severe hazard of erosion on this soil, but losses have been only moderate. If the soil is cropped regularly, however, careful management is needed to control further washing. Erosion can be controlled if crops are grown in narrower strips and in longer rotations than those on the less sloping Butlertown soils. Also needed are practices for the diversion and disposal of excess water. (Capability unit IIIe–16; irrigation group 13; woodland suitability group 9)

Butlertown silt loam, 5 to 10 percent slopes, severely eroded (BuC3).—This soil has lost much of its original surface layer through erosion, and the subsoil is exposed in places. Deep plowing turns up considerable subsoil material and mixes it with the remaining surface layer.

Clean-tilled crops are not well suited to this soil and should be grown only occasionally in a long rotation and under very careful management. Generally, safer and more suitable uses are hay and pasture. Erosion control practices needed consist of planting crops in contoured strips and providing diversions and waterways adequate to dispose of excess water. (Capability unit IVe–9; irrigation group 13; woodland suitability group 17)

Coastal Beaches

Coastal beaches (Cb) occur along the shores of Chesapeake Bay and along the Chester and other major rivers. These beaches consist of loose sand that is worked and reworked by waves, tides, and winds. Because of this movement, no soil profile has developed and there is little if any vegetation. Beach goldenrod, American beachgrass, and clumps of switchgrass occur in some places, and loblolly and Virginia pines grow in some older areas that are partly stabilized.

Some of the beaches are smooth; others are hummocky and have short, complex slopes. They have no real value for farming and are important mainly for recreation and wildlife. Some beaches are too small or too narrow to be mapped (fig. 2). (Capability unit VIIIs–2; woodland suitability group 20)

Downer Series

The soils of the Downer series are deep and well drained. They developed on uplands in deposits of sand that contained an appreciable amount of silt and clay. These soils have a thick, sandy surface layer and a rather thin subsoil that also is sandy but contains more fine material.

In cultivated areas these soils have a plow layer of dark grayish-brown, very crumbly or almost loose loamy sand. The subsurface layer, to a depth of about 18 inches, is much the same but is yellowish brown. The subsoil of dark-brown sandy loam is finer textured and stickier than the upper layers but is almost as crumbly. Below a depth of about 32 inches is brown, generally loose loamy sand that extends to a depth of 40 inches and is underlain by yellow loose sand.

Undisturbed Downer soils are strongly acid to extremely acid unless they have been limed. In places the subsoil is a little more reddish than typical and is somewhat stickier because it contains a little more clay.

The Downer soils are similar to the Sassafras soils in this county, but they are more sandy throughout and have a thicker surface layer and a thinner subsoil. They hold a little less moisture than the Sassafras soils and are a little lower in plant nutrients. The Downer soils

Figure 2.—**Typical area of Coastal beaches, too small to be shown on map, along Chesapeake Bay.**

resemble the Galestown soils in some respects, but they are less sandy throughout and have a finer textured subsoil.

The Downer soils are fairly extensive and have a total area of about 5,000 acres in Queen Annes County. These soils are important agriculturally and are excellent for truck crops, especially sweetpotatoes. They also are used intensively for soybeans and other crops. The soils do not require drainage, but if rainfall is scanty or irregular, they benefit from irrigation.

Although the surface layer of these soils is quite sandy, areas that are not too steep are suitable for homesites, septic tank disposal fields, and many other nonagricultural uses.

Downer loamy sand, 0 to 2 percent slopes (DoA).—Although this nearly level soil is subject to little or no erosion, it is rather low in plant nutrients and can hold a rather small amount of moisture available for plants. Special practices are needed to maintain fertility. Irrigation is beneficial in dry periods. (Capability unit IIs–4; irrigation group 3; woodland suitability group 7)

Downer loamy sand, 2 to 5 percent slopes (DoB).—This is the most extensive and most important Downer soil in the county. Some of its surface layer has been lost through washing in local areas, but the surface and subsurface layers still have a total thickness of about 15 inches. In managing this soil, sandiness is a greater problem than the erosion hazard, though unprotected areas wash when wet and blow when dry. Further losses of soil can be checked if fairly simple practices are used. (Capability unit IIs–4; irrigation group 3; woodland suitability group 7)

Downer loamy sand, 5 to 10 percent slopes (DoC).—The surface layer of this soil ranges from 12 to 15 inches or more in thickness. In some places, however, part of this layer has been lost through washing or blowing. Erosion is a serious hazard and must be controlled if the soil is cultivated regularly. Additional measures are needed to improve and maintain fertility. Unless it is irrigated, the soil is droughty in dry periods. (Capability unit IIIe–33; irrigation group 3; woodland suitability group 8)

Downer loamy sand, 5 to 10 percent slopes, severely eroded (DoC3).—Most of the original surface layer has been lost from this soil, and plowing to a normal depth turns up some of the browner or slightly redder subsoil. Consequently, freshly worked fields are spotty in color. To control further erosion, tilled crops should be grown on this soil only occasionally and only under the best management. Areas that have good air drainage are well suited to sodded orchards. (Capability unit IVe–5; irrigation group 3; woodland suitability group 13)

Downer loamy sand, 10 to 15 percent slopes (DoD).—This soil is used for crops in some areas, but much of it is still wooded. It has a surface layer 12 inches or more thick. Because erosion is a severe hazard in cultivated areas, the soil should be farmed in long rotations and kept in sod or other close-growing plants most of the time. (Capability unit IVe–5; irrigation group 3; woodland suitability group 8)

Downer loamy sand, 10 to 15 percent slopes, severely eroded (DoD3).—This severely eroded soil has lost most of its original loamy sand surface layer. In places a thin layer of loamy sand remains, but in others the subsoil is exposed, and in some spots a large part of the subsoil has been washed away. The soil is too erodible for safe cultivation and should be kept covered with trees, grass, or both. Woodland is the best use, but pasture and orchards also are suitable. Grazing of pasture should be carefully controlled, and orchards protected by sod. (Capability unit VIe–2; woodland suitability group 13)

Downer loamy sand, 15 to 30 percent slopes (DoE).—This steep soil occurs on the sides of small ravines and, in places, along river bluffs. Most of it remains wooded and has not been exposed to the erosive force of wind and water. Because it is steep, however, this soil has a thinner surface layer than the less sloping Downer soils. The surface layer is 10 to 14 inches thick.

This soil generally is unsuitable for cultivation because it is highly susceptible to erosion. It can be safely used as woodland or for sodded orchards or, if carefully grazed, for pasture. (Capability unit VIe–2; woodland suitability group 9)

Elkton Series

In the Elkton series are poorly drained, loamy or silty soils of the uplands. These soils have a fine-textured subsoil that is slowly permeable to water, air, and roots.

In wooded areas the very dark brown surface layer and gray subsurface layer are silt loam or loam that is crumbly but somewhat sticky. The subsoil of gray, firm, fine silty clay is mottled with brown and yellowish brown and is sticky and plastic. Below a depth of about 42 inches is firm, light-gray silty clay that is mottled with brown. This layer is sandy in some places, but it ranges from nearly pure clay to almost pure sand.

In cultivated areas the plow layer generally is dark gray or dark grayish brown. In most places the Elkton soils are very strongly acid or extremely acid unless they have been limed. In many places the substratum is less strongly acid than the layers above it.

In color and drainage, the Elkton soils resemble the Fallsington and Othello soils, but they are not so sandy as the Fallsington soils and are not so silty in the subsoil as the Othello soils. Elkton soils developed in material similar to that of the moderately well drained Keyport soils, the poorly drained Bladen soils, and the very poorly drained Bayboro soils. The Elkton soils have a thinner, lighter colored, less prominent surface layer than the Bladen soils. In addition, their subsurface layer is lighter colored than that of Bladen soils, and their subsoil is less slowly permeable.

The Elkton soils are extensive, particularly in the south-central part of the county. About half their total acreage has been cleared, and the rest remains as woodland. Where drainage has been improved, the soils are commonly used for corn and soybeans and fairly large areas are in pasture. Good stands of loblolly pine occur in some wooded areas, but little timber is produced on much of the acreage. Wooded areas could be used for crops if they were drained and cleared, or they could be made more productive of wood products if management were improved. Locally, the Elkton soils are sometimes called white oak soils.

Elkton loam (Ek).—This level or nearly level soil has a fine-textured, slowly permeable subsoil. Some of the acreage is used for crops, some areas are grazed, and

woodland is common. If drained, the soil is suitable for cropping and is particularly suited to corn and soybeans. In wooded areas the stands generally consist of water-tolerant hardwoods, but in places loblolly pine occurs as scattered trees or in almost pure stands. (Capability unit IIIw–9; drainage group 8–2B; irrigation group 12; woodland suitability group 1)

Elkton silt loam, 0 to 2 percent slopes (EnA).—This soil has a surface layer that is more silty and somewhat less sandy than Elkton loam. It also is slightly more difficult to work and is somewhat more difficult to drain. In other respects, the soil is used and managed in about the same way as Elkton loam.

In addition to excellent pasture (fig. 3), corn and soybeans are extensively grown on this soil. Also, the soil is one of the best in the county for woodland. (Capability unit IIIw–9; drainage group 8–2B; irrigation group 12; woodland suitability group 1)

Elkton silt loam, 2 to 5 percent slopes, moderately eroded (EnB2).—This gently sloping soil has more rapid runoff and is more susceptible to erosion than Elkton silt loam, 0 to 2 percent slopes. Although surface drainage is fairly good, internal drainage is poor, and drainage is the most important management problem. Open ditches, properly spaced, are adequate for removing excess water. If drainage is improved and further erosion is controlled, the soil is suited to the same kinds of crops as other Elkton soils. (Capability unit IIIw–9; drainage group 8–2B; irrigation group 12; woodland suitability group 1)

Fallsington Series

The Fallsington series consists of poorly drained soils on uplands. These soils developed in sandy material that contained some silt and clay. They have grayish surface and subsurface layers and a mottled subsoil of heavy sandy loam or sandy clay loam that is underlain by a sandier substratum.

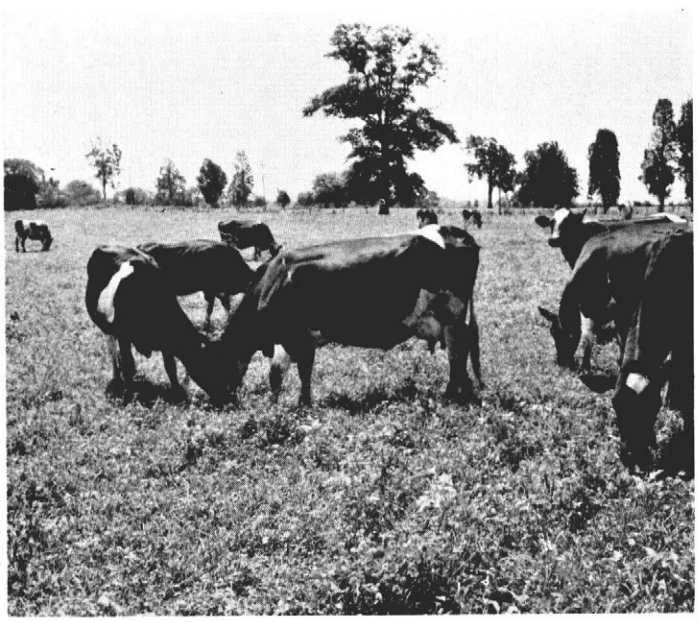

Figure 3.—**Holstein cattle grazing an excellent stand of orchardgrass and Ladino clover on Elkton silt loam, 0 to 2 percent slopes.**

In wooded areas the surface and subsurface layers are loam or sandy loam, but the surface layer is very dark grayish brown, and the subsurface layer is gray. The subsoil consists of sandy clay loam that is gray or light brownish gray mottled with yellowish brown and brownish yellow. Below a depth of about 35 inches is a substratum that is sandy and, in some places, gravelly. It is light brownish gray mottled with grayish brown and yellowish brown.

The Fallsington soils are strongly acid to extremely acid unless they have been limed. The depth to the sandy or gravelly substratum ranges from 20 to 40 inches. Cultivated areas generally have a dark grayish-brown plow layer.

The Fallsington soils developed in the same or somewhat the same kind of material as the better drained Sassafras and Woodstown soils and the more poorly drained Pocomoke soils. Fallsington soils are similar to the Othello, Elkton, and Bladen soils in color and drainage, but they are much more sandy and less silty or clayey throughout and generally are more easily drained.

The Fallsington soils are extensive in Queen Annes County. They are poorly drained and seasonally wet, however, and have a water table near the surface during wet months. Extensive drainage is needed if the soils are cultivated.

These soils produce good yields of trees used for timber, particularly loblolly pine, but they have severe limitations for many nonfarm uses because of the high water table. For example, basements are difficult to construct and to keep dry, and septic tanks fail to function properly when the soils are wet.

Fallsington loam, 0 to 2 percent slopes (FaA).—This extensive soil is important for crops and as woodland in the county. Because the soil is level or nearly level, there is little or no erosion. Poor drainage is a problem, but if drains are properly installed and maintained, the soil is well suited to most crops commonly grown, especially corn and soybeans. (Capability unit IIIw–7; drainage group 7–A; irrigation group 13; woodland suitability group 1)

Fallsington loam, 2 to 5 percent slopes (FaB).—This soil has better surface drainage but is more susceptible to erosion than Fallsington loam, 0 to 2 percent slopes. Although surface drainage is fairly good, the soil must be drained by tiling or ditching before it can be used for cultivated crops. The erosion hazard is only slight in most places, but erosion has occurred in a few scattered areas. (Capability unit IIIw–7; drainage group 7–A; irrigation group 13; woodland suitability group 1)

Fallsington sandy loam, 0 to 2 percent slopes (FdA).—This soil is somewhat more sandy than Fallsington loam, 0 to 2 percent slopes, particularly in the surface layer. It is easier to work than that soil and is somewhat easier to drain (fig. 4). Erosion generally is not a hazard. In a few places the soil is somewhat more sandy than normal, and in some small areas the sand in the surface layer is finer.

Drained areas of this soil are commonly used for corn, soybeans, hay, and pasture. Most undrained areas remain wooded. Good stands of loblolly pine make up much of the woodland. (Capability unit IIIw–6; drainage group 7–B; irrigation group 9; woodland suitability group 1)

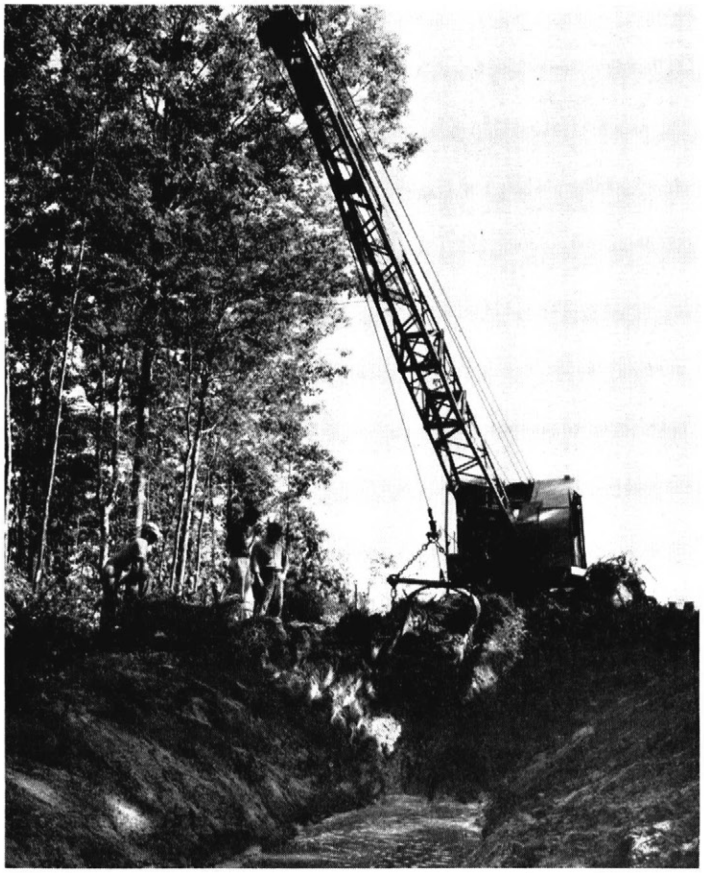

Figure 4.—**Constructing a drainage ditch by use of a dragline through Fallsington sandy loam, 0 to 2 percent slopes, near Hayden.**

Fallsington sandy loam, 2 to 5 percent slopes (FdB).—This soil has more rapid runoff and better surface drainage than Fallsington sandy loam, 0 to 2 percent slopes. About half the acreage has lost an appreciable part of the surface layer through erosion. Although the surface layer is fairly well drained, improved drainage is needed if the soil is to be used for crops. Erosion can be controlled by fairly simple practices, included the use of suitable crop rotations and the careful disposal of runoff. (Capability unit IIIw–6; drainage group 7–B; irrigation group 9; woodland suitability group 1)

Galestown Series

The Galestown series consists of deep, sandy, somewhat excessively or excessively drained soils that have a distinctly brown, sandy subsoil. These soils are on level to somewhat rolling uplands and on old terraces, or they are on natural levees above major streams. Some areas are dunelike.

The Galestown soils developed in deep beds of sand and a little fine material, all deposited over much older beds of generally finer textured material. In level or gently sloping areas, the soils have a finer textured, moisture-retaining substratum within 5 or 6 feet of the surface. In steeper areas this layer generally is missing or occurs at a greater depth.

In wooded areas these soils have a dark-gray surface layer and a grayish-brown subsurface layer, both of which are crumbly to almost loose loamy sand. Between the depths of 8 and 39 inches is a subsoil of loamy sand that is brown because the sand grains are coated with brown clay. Below the subsoil is loose, yellowish-brown sand that commonly extends to a depth of about 55 inches, where it is abruptly underlain by a substratum of sandy loam that is pale brown streaked with light gray. The substratum holds considerable moisture. In steeper areas it is lacking or occurs only at great depth.

In most plowed areas the surface layer is dark grayish brown. In some places the subsoil is reddish brown or yellowish red instead of brown, but everywhere it is more reddish than the layers above and below it. Because the lower substratum of sandy loam is usually wet, it furnishes moisture to deep-rooted crops in dry seasons.

The Galestown soils generally occur with the Lakeland and Downer soils. They are browner or redder and less yellow than the Lakeland soils, and their subsoil and generally their other layers contain much less silt and clay than those in the Downer soils. The Galestown soils developed in about the same kind, or nearly the same kind, of material as the Klej soils, which are moderately well drained, and the Plummer soils, which are poorly drained.

Galestown soils are inextensive in this county. They occur mainly along the blufflike banks on the south side of the Chester River between Kings Town and Unicorn. Except where they have been limed, these soils are very strongly acid or extremely acid. If lime or limestone is added, it should be applied only in moderate amounts, according to needs indicated by soil tests.

Galestown loamy sand, clayey substratum, 0 to 5 percent slopes (GaB).—This inextensive soil occurs mostly in broad, nearly flat areas above the banks of the Chester River in the northern part of the county. It is used mainly for corn and soybeans, but it can be used for truck crops and would be well suited to them if irrigation water were available in dry periods. Although the soil is easy to work and warms up quickly in spring, it does not retain plant nutrients for long, and it has low available moisture capacity above the clayey substratum.

If this soil is heavily fertilized and is limed where needed, it produces good yields of crops. Generally, it is not subject to washing, but the surface layer blows readily when dry unless it is protected by vegetation. In some places windbreaks would be an effective way of controlling wind erosion. (Capability unit IIIs–1; irrigation group 1; woodland suitability group 5)

Galestown loamy sand, clayey substratum, 5 to 10 percent slopes (GaC).—This soil is more susceptible to water erosion and is a little more droughty than Galestown loamy sand, clayey substratum, 0 to 5 percent slopes. Because slopes are strong, the choice of crops is somewhat limited. The soil is readily permeable, and water intake is rapid if runoff is slowed by a cover of plants. (Capability unit IVs–1; irrigation group 1; woodland suitability group 5)

Galestown sand, clayey substratum, 0 to 5 percent slopes (GcB).—This soil is more sandy above the clayey substratum than Galestown loamy sand, clayey substratum, 0 to 5 percent slopes. It is easily worked and in some places is used for crops, but it is so sandy that the

choice of crops is limited. Yields generally are low unless large amounts of fertilizer are applied. (Capability unit IVs–1; irrigation group 1; woodland suitability group 5)

Galestown and Lakeland loamy sands, 10 to 15 percent slopes (GkD).—These soils occur in small areas scattered throughout the county, mostly in the northern part. Individual areas consist of Galestown loamy sand, or Lakeland loamy sand, or both soils in an intricate pattern.

These strongly sloping soils do not have a clayey substratum within 6 feet of the surface. For this reason, they are more droughty than the Galestown and Lakeland soils that have a clayey substratum, and in most places they are not suitable for crops or pasture. They are fairly well suited as woodland. Good existing stands of loblolly, Virginia, and shortleaf pines should be managed for the production of timber or pulpwood. Planting seedlings of loblolly pine or other pines is practical in many places. (Capability unit VIIs–1; woodland suitability group 5)

Galestown and Lakeland loamy sands, 15 to 30 percent slopes (GkE).—In places where these soils have a cover of desirable trees, they can be used to produce timber or pulpwood. Some areas are suitable for planting to pines. (Capability unit VIIs–1; woodland suitability group 6)

Galestown and Lakeland sands, 5 to 10 percent slopes (GlC).—These soils are more sandy than Galestown and Lakeland loamy sands. In most places they do not have a moisture-retaining substratum within reasonable depth, and they probably are the most droughty soils in the county. They are not suited to crops or pasture, but they can produce some timber and, in some places, support fairly good stands of Virginia pine or loblolly pine. If they are covered by plants, these soils make good areas for sheltering some kinds of wildlife. (Capability unit VIIs–1; woodland suitability group 5)

Gravel and Borrow Pits

Gravel and borrow pits (Gr) are areas from which soil material has been taken for use in highway construction and for other purposes. These pits are not suitable for farming, but some could be improved and used as shelter areas for wildlife by filling and grading them, providing an outlet for drainage water, and planting grasses, shrubs, or trees. (Capability unit VIIIs–4; woodland suitability group 21)

Johnston Series

In the Johnston series are very poorly drained soils on flood plains, or first bottoms, along streams. These soils formed in material that washed from silty and sandy soils on uplands. The surface layer of Johnston soils is very dark colored because it contains an accumulation of organic matter.

Cultivated areas have a plow layer of black, crumbly loam. This is underlain by black, crumbly loam or fine sandy loam that extends to a depth of about 30 inches. Generally, below the black layers are several inches of light-gray sand that is loose and tends to flow when wet. In many places there is a substratum of light-gray or white fine sandy clay that is blotched with light olive brown. The water table is in the substratum most of the year.

The black layers in these soils range from 10 to more than 30 inches in total thickness. In small areas the black layers are fairly sandy and generally are thinner than in other areas. Where the soils are unplowed, the surface layer is rather mucky. The layer of loose, light-gray sand is missing in some places.

These soils normally are very strongly acid or extremely acid. Liming is required for the best growth of most crops.

The Johnston soils are less silty but are darker colored and more poorly drained than the Bibb soils, which also occur on flood plains. In some respects the Johnston soils resemble the Pocomoke and Portsmouth soils of the uplands, but they have a thicker surface layer and lack a true subsoil.

The Johnston soils are fairly extensive in the county. They are subject to flooding, and in some places they are difficult to clear and to drain. Once drainage is established and maintained, however, these soils are suited to many kinds of crops grown in the county. Corn is the most common crop, but soybeans, hay, and pasture also are grown.

Johnston loam (Jo).—This is the only Johnston soil in Queen Annes County. Included with it in mapping are spots where the surface layer is more sandy than typical. Also included are a few areas where the topmost few inches are mucky.

Along Long Marsh Ditch and other stream channels that have been cleaned, straightened, and deepened, this soil commonly is drained well enough for crops. However, lateral ditches are needed to drain some of the wider flood plains. Corn is the chief crop, though wetness delays planting in some years. Several areas are in good pasture, and undrained areas that are wet or swampy commonly support water-tolerant hardwoods. (Capability unit IIIw–7; drainage group 11–A; irrigation group 10; woodland suitability group 2)

Keyport Series

In the Keyport series are moderately well drained soils that have a fine-textured, slowly permeable subsoil. These soils developed in beds of acid clay or silty clay that, in some places, are underlain by sandier material.

Undisturbed Keyport soils have a thin, dark-gray surface layer and a fairly thin, light yellowish-brown subsurface layer. These layers both are crumbly but slightly sticky loam or silt loam. The upper subsoil is brownish-yellow, firm silty clay that is plastic and sticky. The middle part of the subsoil is light olive-brown silty clay or clay that is mottled with brown and light gray and is plastic and very sticky. The lower subsoil, to a depth of about 44 inches, is dark-gray, very firm, plastic and sticky clay with brown and light-gray mottles. Below the subsoil is massive clay that is gray streaked with grayish brown.

The Keyport soils are strongly acid to extremely acid, except where they have been limed. In cultivated areas the plow layer generally is grayish brown or dark grayish brown. The depth to mottling ranges from 20 to 27 inches, and the depth to the gray substratum ranges from 30 to 45 inches. The substratum is variable, especially in texture and consistence. It ranges from crumbly sandy

loam to fine, tough clay. The most distinctive characteristic of the Keyport soils is their subsoil of mottled, firm and tough, plastic and sticky clay or silty clay, through which water passes very slowly.

The Keyport soils are better drained than the Elkton, Bladen, and Bayboro soils, though they developed in about the same kind of material. In general appearance they resemble the Woodstown soils, but their subsoil is tough silty clay or clay instead of crumbly sandy clay loam. The Keyport soils somewhat resemble the Mattapex soils, but their clayey subsoil is less readily penetrated by air, water, and roots than the silty subsoil of the Mattapex soils.

The Keyport soils are fairly extensive in Queen Annes County and are important in agriculture. They produce moderate to rather high yields of most crops if they are well managed, artificially drained, and protected from erosion. Alfalfa and other deep-rooted perennial crops are not well suited, because these soils are wet in winter and spring and tend to heave through frost action.

Keyport loam, 0 to 2 percent slopes (KeA).—Artificial drainage is needed on this soil for disposing of excess water, mainly early in spring. Open ditches generally are best because tile lines do not function well in the clayey subsoil. If the soil is drained and well managed, it produces good yields of most common crops except alfalfa. (Capability unit IIw–8; drainage group 6–2A; irrigation group 12; woodland suitability group 11)

Keyport loam, 2 to 5 percent slopes, moderately eroded (KeB2).—This soil has better surface drainage but is more erodible than Keyport loam, 0 to 2 percent slopes. Some areas have lost part of the surface layer through erosion, and many areas are likely to erode unless they are protected by measures that retard runoff and carefully dispose of excess water. (Capability unit IIe–13; drainage group 6–2A; irrigation group 12; woodland suitability group 11)

Keyport silt loam, 0 to 2 percent slopes (KpA).—This is the most extensive Keyport soil in the county. It is used and managed in about the same way as Keyport loam, 0 to 2 percent slopes, but it is slightly less easy to work and to drain. The soil is not suited to alfalfa or other perennial crops, because it is wet in winter and spring and frost causes heaving, which damages such crops. (Capability unit IIw–8; drainage group 6–2A; irrigation group 12; woodland suitability group 11)

Keyport silt loam, 2 to 5 percent slopes, moderately eroded (KpB2).—This soil is more susceptible to erosion than Keyport silt loam, 0 to 2 percent slopes. Because the subsoil is very slowly permeable, much of the water from rain and melting snow runs off. Consequently, a heavy rain or a quick thaw can cause serious washing. Measures are needed to protect the soil from further erosion. (Capability unit IIe–13; drainage group 6–2A; irrigation group 12; woodland suitability group 11)

Keyport silty clay loam, 5 to 10 percent slopes, severely eroded (KrC3).—The original surface layer of this soil was loam or silt loam, but most of it has been lost through erosion, and in places the subsoil is exposed. Because plowing has mixed the small remaining part of the surface layer with considerable material from the subsoil, the plow layer now is silty clay loam. Included in mapped areas are a few scattered acres that are not severely eroded.

This severely eroded soil generally is not suited to cultivated crops. It is best used for pasture or long-term hay, but diversion terraces are needed for safely disposing of runoff. (Capability unit VIe–2; woodland suitability group 17)

Keyport silty clay loam, 10 to 15 percent slopes, severely eroded (KrD3).—This soil is too steep and too severely eroded for use as cropland. It has lost all or nearly all of its original surface layer, and the present surface layer consists mostly of subsoil material. The soil is likely to erode further unless it is kept in vegetation or is otherwise protected.

Hay crops and pasture generally are not safe uses for this soil, though a good sod can provide some forage if grazing is carefully controlled. Forested areas should be protected and well managed. Most cleared areas should be reforested by planting loblolly pine and protecting the seedlings from grazing and fire. (Capability unit VIIe–2; woodland suitability group 17)

Klej Series

The Klej series consists of moderately well drained soils that developed in beds of sandy material on uplands. The lower part of the sandy material is mottled because aeration is somewhat poor and drainage is impeded by a fluctuating high water table. In most places there is a finer textured, moisture-retaining substratum 4 to 5 feet below the surface.

In wooded areas the surface layer is grayish-brown, very crumbly loamy sand about 9 inches thick. Below this, to a depth of about 39 inches, is olive-yellow, loose loamy sand that is mottled and streaked with light brownish gray below a depth of about 19 inches. Underlying the loamy sand is loose sand that is light brownish gray mottled with light gray and brownish yellow. At a depth of about 47 inches is a finer textured substratum of light-gray sandy loam that is coarsely mottled with light yellowish brown. This layer is sticky and slightly plastic, and it appears to support the water table.

Although the Klej soils are strongly acid to extremely acid, great care must be taken to avoid overliming. In cultivated areas the plow layer normally is grayish brown to dark gray.

The Klej soils developed in about the same kind of material as the Galestown, Lakeland, and Plummer soils, but they are not so well drained as the Galestown and Lakeland soils and are better drained than the Plummer soils. The Klej soils are sandier throughout than the Woodstown soils, and they lack the finer textured subsoil that characterizes the Woodstown soils.

The Klej soils are not extensive in this county. They occur mostly in the northern part and generally are fairly close to the Chester River. Although they can be used for most common crops, their impeded drainage is an important management problem. In addition, the soils are so sandy that they do not retain plant nutrients well, and they are droughty in dry periods. Erosion generally is not a hazard.

Klej loamy sand, 0 to 2 percent slopes (KsA).—This soil is moderately well drained and generally is not wet for long periods. In some places, however, the water table is near the surface until late in spring and delays the planting of crops. Tiling is effective in removing excess

water and in rapidly lowering the water table. Erosion generally is not a problem.

If this soil is drained, it is suited to most crops, especially late-maturing truck crops. It is likely to be droughty in dry periods that are long and hot, and supplemental irrigation may be needed for vegetables and some other crops. Because the soil does not retain nutrients well, heavy additions of fertilizer are needed for most crops. (Capability unit IIIw–10; drainage group 4; irrigation group 1; woodland suitability group 3)

Klej loamy sand, 2 to 5 percent slopes (KsB).—This gently sloping soil is slightly more susceptible to erosion than Klej loamy sand, 0 to 2 percent slopes. Included with it in mapping are a few acres that have lost some of the surface layer.

Impeded drainage is the main problem in using and managing this soil, but droughtiness, the erosion hazard, and the fertility level must also be considered. (Capability unit IIIw–10; drainage group 4; irrigation group 1; woodland suitability group 3)

Lakeland Series

The Lakeland series consists of somewhat excessively drained or excessively drained, sandy soils that formed in beds of sandy material on uplands. At a depth of 5 to 6 feet, there generally are layers of finer-textured material that help to retain moisture in dry periods.

These soils have a thin surface layer of grayish-brown, very crumbly loamy sand. Below this and extending to a depth of about 33 inches is pale-yellow to yellowish-brown, loose loamy sand. Between the depths of 33 and 58 inches is very pale brown, loose sand that is slightly streaked with light gray in the lower part. At about 58 inches is a layer of light-gray, compact sandy loam that is streaked with grayish brown. This layer is sticky and slightly plastic.

The Lakeland soils are strongly acid to extremely acid unless they have been limed. In cultivated areas the plow layer generally is grayish brown or dark grayish brown. Even in dry periods, the underlying layer of sticky sandy loam retains some moisture for deep-rooted plants. In most places this layer occurs within 5 to 6 feet of the surface, but in some places it is lacking.

Below the surface layer, the Lakeland soils are distinctly more yellowish and less strongly brown than the Galestown soils. In addition, they generally occupy nearly level and slightly dunelike areas, though in some places they occur on steep slopes. The Lakeland soils developed in the same kind or about the same kind of material as the Klej and Plummer soils, but they are much better drained than those soils.

The Lakeland soils are not extensive in this county. They are suited to most crops grown locally and, in many places, are used for truck crops and sweetpotatoes.

Some of the more strongly sloping Lakeland soils are mapped with Galestown soils in undifferentiated groups of Galestown and Lakeland sands or loamy sands. These mapping units are described under the heading "Galestown Series."

Lakeland loamy sand, clayey substratum, 0 to 5 percent slopes (LaB).—This soil is fairly extensive in the northern and northeastern parts of the county. Although it warms quickly in spring and can be worked when it is fairly wet, it tends to be droughty in hot, dry weather, and all but the most deep-rooted crops may be damaged by lack of moisture. Because the soil is very low in plant nutrients and does not retain them well, heavy and frequent applications of fertilizer are needed for maximum production of most crops.

Much of this soil remains in scrub hardwoods, Virginia pine, and a few loblolly pines. Cleared areas are used for many crops and are especially well suited to early truck crops. Erosion normally is slight, but if the soil is left bare, it blows readily when dry. Supplemental irrigation is needed in dry periods. (Capability unit IIIs–1; irrigation group 1; woodland suitability group 5)

Lakeland loamy sand, clayey substratum, 5 to 10 percent slopes (LaC).—This soil is more susceptible to erosion than Lakeland loamy sand, clayey substratum, 0 to 5 percent slopes, and in some places its surface is slightly dunelike. In addition, it is suited to fewer kinds of crops and must be more carefully managed. The soil is well suited to orchards if it is protected most of the time by a close-growing cover crop. (Capability unit IVs–1; irrigation group 1; woodland suitability group 5)

Made Land

Made land (Ma) consists of areas where the soil material has been disturbed or modified by man and can no longer be identified by soil series or soil type. These are areas on which fill material has been deposited, or from which soil material has been removed as a result of leveling or other activities.

This land has almost no agricultural use. Most areas are used for residential or commercial purposes. (No capability unit; woodland suitability group 21)

Matapeake Series

The Matapeake series consists of well-drained soils on uplands. These soils developed in silty material, probably loess, that overlies sandy material.

Cultivated areas have a thick surface layer of fine sandy loam, loam, or silt loam that is dark grayish brown and very crumbly. The somewhat firm and sticky subsoil of yellowish-brown heavy silt loam or light silty clay loam extends to a depth of about 32 inches. Below the subsoil is a transitional layer, a few inches thick, of brown, firm, fine sandy clay loam. This layer is underlain by sandy material that is fine sandy loam in the upper part and rapidly becomes more sandy with depth. It is grayish brown in color and crumbles easily.

Except in areas that have been limed, the Matapeake soils are strongly acid or very strongly acid. In unplowed areas the surface layer is rather thin and is dark brown to very dark grayish brown. The yellowish-brown subsurface layer is very crumbly. These layers normally contain some fine sand and very fine sand, whereas the sand in the substratum is distinctly coarser.

The Matapeake soils have a siltier surface layer and subsoil than the Sassafras soils, which developed in much sandier material that had no distinct mantle of silty material. Matapeake soils developed in the same kind of material as the moderately well drained Mattapex soils, the somewhat poorly drained Bertie soils, the poorly

drained Othello soils, and the very poorly drained Portsmouth soils.

The Matapeake soils are extensive in this county. They occur in the western part, chiefly on Kent Island, Wye Island, Wye Neck, Piney Neck, Tilghman Neck, and in the area between Queenstown and Grasonville. Smaller areas are north and west of Centreville. These soils are among the best soils for farming and are used for all crops.

Matapeake fine sandy loam, 0 to 2 percent slopes (MbA).—This nearly level soil is one of the best for crops in the county, though its total acreage is small. It has been little affected by erosion and has a crumbly plow layer that is easy to work. If common methods of good farming are used, almost all kinds of crops can be grown. (Capability unit I–5; irrigation group 9; woodland suitability group 7)

Matapeake fine sandy loam, 2 to 5 percent slopes, moderately eroded (MbB2).—Erosion is a greater hazard on this gently sloping soil than on Matapeake fine sandy loam, 0 to 2 percent slopes. In some places erosion has removed an appreciable part of the surface layer, and deep plowing turns up a little of the finer textured, yellowish-brown subsoil.

Nevertheless, if this soil is well managed, it can be cultivated regularly and is suitable for almost any use. Among the practices needed to check further erosion are stripcropping, cultivating on the contour, rotating crops, and maintaining close-growing crops at least part of the time. (Capability unit IIe–5; irrigation group 9; woodland suitability group 7)

Matapeake fine sandy loam, 5 to 10 percent slopes, moderately eroded (MbC2).—This soil is more susceptible to erosion than Matapeake fine sandy loam, 0 to 2 percent slopes, and it has lost more of its original surface layer. Consequently, it is suitable for fewer uses and is less productive.

If this soil is well protected, it can be used safely for most crops. Close-growing crops are required more of the time than on less sloping Matapeake soils, and measures are needed to control further soil losses. (Capability unit IIIe–5; irrigation group 9; woodland suitability group 8)

Matapeake fine sandy loam, 5 to 10 percent slopes, severely eroded (MbC3).—This severly eroded soil has strong limitations that restrict its use for cultivated crops. Ordinarily, it should not be used for these crops more often than once in 5 years, and it is best kept in hay or other close-growing plants the rest of the time. Further erosion can be controlled by safely removing excess runoff and by growing crops in fairly narrow strips along the contour. The soil is well suited to sodded orchards. (Capability unit IVe–5; irrigation group 9; woodland suitability group 13)

Matapeake loam, 0 to 2 percent slopes (McA).—This soil is used and managed in much the same way as Matapeake fine sandy loam, 0 to 2 percent slopes. If ordinary good farming methods are used, the soil is easy to manage and is one of the best in the county for all the common crops. (Capability unit I–4; irrigation group 13; woodland suitabiltiy group 7)

Matapeake loam, 2 to 5 percent slopes, moderately eroded (McB2).—This fairly extensive soil is more difficult to conserve than Matapeake loam, 0 to 2 percent slopes. Some areas have had a few inches of the surface layer washed away. If the soil is protected from further erosion, however, it is suitable for regular cultivation. (Capability unit IIe–4; irrigation group 13; woodland suitability group 7)

Matapeake loam, 5 to 10 percent slopes, moderately eroded (McC2).—Erosion has been more uniform on this soil than on less sloping Matapeake soils, and the need for protective measures is greater, If the soil is deep plowed, subsoil material is turned up in places. Among the practices needed in cultivated areas are contour tillage and contour stripcropping. (Capability unit IIIe–4; irrigation group 13; woodland suitability group 8)

Matapeake loam, 5 to 10 percent slopes, severely eroded (McC3).—This soil has lost most of its surface layer through erosion, and in places the subsoil is exposed. Ordinary plowing turns up part of the subsoil in most places, and deep plowing turns up a larger amount. As a result, the soil has a plow layer that is more difficult to manage, is lower in organic-matter content, and is much more easily eroded by water than the surface layer of less eroded Matapeake soils.

Close-growing crops, such as plants used for hay or pasture, should be kept on this soil most of the time. Clean-tilled crops can be safely grown only about 1 year in 5. The soil is excellent for orchards if it is protected by close-growing cover. (Capability unit IVe–3; irrigation group 13; woodland suitability group 13)

Matapeake silt loam, 0 to 2 percent slopes (MkA).—This is one of the best agricultural soils in the county. It is nearly level, is subject to little or no erosion, and has practically no limitations for cropping or other uses. It has high available moisture capacity and is highly productive under good management. (Capability unit I–4; irrigation group 13; woodland suitability group 7)

Matapeake silt loam, 2 to 5 percent slopes, moderately eroded (MkB2).—This fairly extensive soil is more susceptible to erosion than Matapeake silt loam, 0 to 2 percent slopes, and it has lost a significant part of its original surface layer in many places. If the soil is cultivated, measures are needed to control further erosion. Crops grown in contour strips in a 3- or 4-year rotation generally provide sufficient protection if other practices of good farming are used and if care is taken to dispose of excess runoff. (Capability unit IIe–4; irrigation group 13; woodland suitability group 7)

Matapeake silt loam, 5 to 10 percent slopes, moderately eroded (MkC2).—The loss of soil material has been more uniform on this moderately sloping soil than on Matapeake silt loam, 2 to 5 percent slopes, moderately eroded. If the soil is carefully managed, however, it can be cultivated regularly. A 4-year cropping sequence including at least 2 years of hay or close-growing crops is needed, and the crops should be grown in fairly narrow strips on the contour. Excess surface water must be disposed of carefully to prevent further washing. (Capability unit IIIe–4; irrigation group 13; woodland suitability group 8)

Matapeake silt loam, 5 to 10 percent slopes, severely eroded (MkC3).—This moderately sloping soil has lost most of its crumbly silt loam surface layer through water erosion. Shallow gullies have formed, and a few deep ones have been cut into the sandy substratum. These gullies should be smoothed and seeded, and the soil protected by close-growing plants most of the time.

This soil can be used for clean-tilled crops 1 year in about 5, but it is better used for continuous hay or pasture or for sodded orchards. (Capability unit IVe–3; irrigation group 13; woodland suitability group 13)

Matapeake soils, 10 to 15 percent slopes (MmD).—These strongly sloping Matapeake soils have a surface layer of fine sandy loam, loam, or silt loam, and are mapped as one unit. They have severe limitations that restrict their use as cropland, but only a few acres have been affected by erosion because most areas remain wooded.

If these soils are cleared, they probably cannot be safely used for cultivated crops. They are excellent for hay or pasture, however, and are suited to sodded orchards. (Capability unit IVe–3; irrigation group 13; woodland suitability group 8)

Matapeake soils, 10 to 15 percent slopes, severely eroded (MmD3).—These soils have been cleared and used for crops, but they have not been well managed and protected. Consequently, most of their original surface layer has been lost in some places, and all of it has been lost in others.

These soils cannot be cultivated regularly, but under good management they can produce good hay crops and excellent pasture. Overgrazing should be avoided, however, because it would destroy the sod and subject the soils to severe damage. These soils can also be protected by planting loblolly pine seedlings for the production of timber or pulpwood. (Capability unit VIe–2; woodland suitability group 13)

Matapeake soils, 15 to 30 percent slopes (MmE).—These steep soils occupy many blufflike areas along streams and rivers in the county. Some areas of the soils are somewhat eroded, but most areas have never been cleared. Generally, the soils should remain wooded, but if cleared, they can be used safely for hay, pasture, or sodded orchards. Good management is needed in wooded areas of hardwoods. Loblolly pine is suitable for planting wherever this tree is preferred. (Capability unit VIe–2; woodland suitability group 9)

Matapeake silt loam, silty substratum, 0 to 2 percent slopes (MoA).—This well-drained soil has a thicker subsoil than Matapeake silt loam, 0 to 2 percent slopes. The subsoil is not sandy in the lower part, and it is underlain by silt that extends to a depth of 6 feet or more.

This soil is possibly the best in the county for farming, at least for most crops, and it has few or no limitations that restrict its use. It is especially well suited to asparagus and similar crops because practically no sand clings to the harvested shoots. (Capability unit I–4; irrigation group 13; woodland suitability group 7)

Matapeake silt loam, silty substratum, 2 to 5 percent slopes, moderately eroded (MoB2).—This soil is smooth or gently undulating, and in places slopes are long. Runoff is fairly rapid on long slopes after heavy rains, and it may remove a significant amount of the surface layer. For this reason, controlling erosion is the main management problem. Nevertheless, if the soil is protected and otherwise well managed, it produces excellent crops under regular cultivation. Especially effective in checking further erosion are good rotations, contour tillage, and stripcropping. (Capability unit IIe–4; irrigation group 13; woodland suitability group 7)

Matapeake silt loam, silty substratum, 5 to 10 percent slopes, moderately eroded (MoC2).—This soil is more strongly sloping than Matapeake silt loam, silty substratum, 2 to 5 percent slopes, moderately eroded. It has lost a fairly uniform and significant part of its silty surface layer, and more intensive measures are needed to control further erosion. By using longer rotations and by planting crops in narrower strips on the contour, this soil can continue to be safely used for cultivated crops. Needed to prevent gullying caused by water concentration is the careful disposal of runoff, generally through sodded waterways. (Capability unit IIIe–4; irrigation group 13; woodland suitability group 8)

Matapeake silt loam, silty substratum, 5 to 10 percent slopes, severely eroded (MoC3).—Because this soil has not been protected, it has been badly damaged through erosion. Most of its original surface layer has been lost, and part of the subsoil is turned up in regular plowing. In places the subsoil is at the surface.

This soil is difficult to work and to manage and, on the average, is much less productive than Matapeake silt loam, silty substratum, 0 to 2 percent slopes. Clean-tilled crops should be grown not more than once in 5 years, and then only in rotation with clover, grass, alfalfa, or other close-growing crops. If the surface between the trees is kept covered by close-growing plants, this is an excellent soil for orchards. (Capability unit IVe–3; irrigation group 13; woodland suitability group 13)

Mattapex Series

In the Mattapex series are moderately well drained soils that developed in silty material underlain by a sandy substratum.

In cultivated areas the plow layer is dark grayish-brown, crumbly fine sandy loam, loam, or silt loam. The upper part of the subsoil is thin and consists of brown, slightly sticky heavy loam. The middle part is yellowish-brown, light silty clay loam that is fairly firm and plastic and sticky. Between the depths of 26 and 36 inches, the lower part of the subsoil is light silty clay loam that is light olive brown mottled with brownish gray and strong brown. This layer is slightly platy, rather firm, and sticky and plastic. Below the subsoil is a very sandy substratum that is yellowish brown but is distinctly mottled with gray.

The Mattapex soils are strongly acid or very strongly acid except where they have been limed. Forested areas have a thin, dark-gray surface layer and a somewhat thicker, yellowish-brown or light olive-brown subsurface layer. In local areas the mottled lower subsoil is firm, dense, and tough.

The Mattapex soils formed in the same kind of silty mantle as the better drained Matapeake soils and the more poorly drained Bertie, Othello, and Portsmouth soils. The Mattapex soils formed in a shallower silty mantle than the Butlertown soils. Soils of both series are moderately well drained, but Mattapex soils generally are mottled 8 to 12 inches nearer the surface and lack the distinctly brittle lower subsoil that is characteristic of the Butlertown soils. In many respects the Mattapex soils are like the Woodstown soils, but the subsoil in the Mattapex is light silty clay loam instead of sandy clay loam, and the surface layer contains much less sand and more silt. The Mattapex soils resemble the Keyport

soils in color and drainage, but they do not have the tight, heavy clay subsoil that is characteristic of Keyport soils.

The Mattapex soils are fairly extensive in Queen Annes County. They are mostly in the western part and occur closely with the Matapeake and the Othello soils. The Mattapex soils are agriculturally important and are used for nearly all crops. However, they are not well suited to deep-rooted perennials, such as alfalfa, because they generally are wet most of the winter and early in spring and are subject to frost heaving. Wetness and heaving also limit their use for some nonfarm purposes.

Mattapex fine sandy loam, 0 to 2 percent slopes (MpA).—This nearly level soil is not affected by erosion, but it has impeded drainage that causes the surface layer to be wet and cold and delays the planting of crops. Excess water can be removed by tile or open ditches. If the soil is adequately drained, it is well suited to most crops except alfalfa. (Capability unit IIw–5; drainage group 2–A; irrigation group 9; woodland suitability group 11)

Mattapex fine sandy loam, 2 to 5 percent slopes, moderately eroded (MpB2).—This soil has more rapid runoff than Mattapex fine sandy loam, 0 to 2 percent slopes, and it is more likely to erode in unprotected fields. Much of it has lost a large part of the original surface layer. Included in mapping are a few acres that are severely eroded.

If this soil is protected by erosion control measures and excess water is carefully removed, most crops can be grown and, under good management, will produce good yields. (Capability unit IIe–36; drainage group 2–A; irrigation group 9; woodland suitability group 11)

Mattapex loam, 0 to 2 percent slopes (MsA).—This soil is not so easy to drain as Mattapex fine sandy loam, 0 to 2 percent slopes, and it is not so easy to work and to cultivate. Nevertheless, if it is adequately drained, it is among the best agricultural soils in the county. (Capability unit IIw–1; drainage group 2–A; irrigation group 13; woodland suitability group 11)

Mattapex loam, 2 to 5 percent slopes, moderately eroded (MsB2).—The surface layer of this soil is not so sandy as that of Mattapex fine sandy loam, 2 to 5 percent slopes, moderately eroded. In other major characteristics, however, the two soils are much the same, and they are used and managed in about the same way. Plowing, cultivating, and draining this soil are somewhat more difficult, and the soil tends to warm up more slowly in spring. (Capability unit IIe–16, drainage group 2–A, irrigation group 13; woodland suitability group 11)

Mattapex loam, 5 to 10 percent slopes, moderately eroded (MsC2).—This moderately sloping soil has a thinner surface layer of less uniform thickness than Mattapex loam, 2 to 5 percent slopes, moderately eroded. Runoff is more rapid, and the erosion hazard is greater. Practically all areas have had a significant amount of the original surface layer washed away. Surface drainage normally is adequate, but internal drainage is slow.

In managing this soil for crops, drainage is needed in some places, but erosion control is the chief need. Further losses of soil can be checked by carefully collecting and disposing of excess surface water. (Capability unit IIIe–16; irrigation group 13; woodland suitability group 9)

Mattapex loam, 5 to 10 percent slopes, severely eroded (MsC3).—This soil has had most of its original surface layer washed away, and it is cut by few to many shallow gullies. Because the hazard of further erosion is so severe, the protection of hay plants or other close-growing cover is needed most of the time. Clean-tilled crops can be safely grown only 1 year in 5 and then only in narrow strips along the contour.

If this soil is kept well sodded, it is fairly good for orchards. To avoid or minimize damage from early or late frosts, each orchard site must have adequate air drainage. Also needed is soil drainage that is carefully maintained. (Capability unit IVe–9; irrigation group 13; woodland suitability group 17)

Mattapex silt loam, 0 to 2 percent slopes (MtA).—This soil is used and managed in much the same way as Mattapex loam, 0 to 2 percent slopes. In spring and other wet periods, excess surface water must be removed before the soil can be put to full agricultural use.

Where excess water is carried off safely, this soil is not likely to erode and generally is highly productive of most crops. Among the good farming practices needed are fertilizing, liming, and rotating of crops. (Capability unit IIw–1; drainage group 2–A; irrigation group 13; woodland suitability group 11)

Mattapex silt loam, 2 to 5 percent slopes, moderately eroded (MtB2).—This fairly extensive soil is productive and is agriculturally important, but much of it has lost a significant part of its original surface layer. If the soil is drained and is protected against further erosion, it can be used for most crops commonly grown. (Capability unit IIe–16; drainage group 2–A; irrigation group 13; woodland suitability group 11)

Mattapex silt loam, 5 to 10 percent slopes, moderately eroded (MtC2).—The loss of soil material from this moderately eroded soil has been fairly uniform. Measures are needed to control further erosion and to keep the soil useful and productive. Excess water can be collected and safely removed in diversion terraces, and soil losses can be controlled if the areas between diversions are laid out in strips that are cropped in a 3-year or, preferably, a 4-year rotation that includes only 1 year of clean-tilled crops. (Capability unit IIIe–16; irrigation group 13; woodland suitability group 9)

Mattapex silt loam, 5 to 10 percent slopes, severely eroded (MtC3).—This soil has been badly damaged by erosion. Most of the original surface layer is gone, and deep plowing turns up a considerable amount of subsoil material. If large amounts of crop residue and other organic material are added, structure and workability can be improved and productivity increased.

This soil can be safely row cropped, but not more than once in 4 or 5 years. Hay or improved pasture is a more suitable use. Like many other soils in the county that are severely eroded, this soil can be used economically for loblolly pine and selected hardwoods. (Capability unit IVe–9; irrigation group 13; woodland suitability group 17)

Mattapex soils, 10 to 15 percent slopes (MxD).—The surface layer of these soils is silt loam, loam, or fine sandy loam. Erosion is only slight, mainly because most areas remain wooded.

Unless these soils are needed for other uses, they probably are best kept as woodland. Even if cleared areas

are carefully managed, the soils can be cropped only in long rotations, or they can be used for hay crops or for improved pasture that is carefully grazed. Some areas may be suitable for sodded orchards. (Capability unit IVe–9; irrigation group 13; woodland suitability group 9)

Mattapex soils, 10 to 15 percent slopes, severely eroded (MxD3) —These soils have been cleared and cropped, and they are much more eroded than Mattapex soils, 10 to 15 percent slopes. Gullies are few to common (fig. 5).

Figure 5.—Gully formed in a cleared area of Mattapex soils, 10 to 15 percent slopes, severely eroded.

Using these soils for clean-tilled crops is likely to result in further erosion. Safer and more suitable uses are hay, carefully grazed pasture, and trees. (Capability unit VIe–2; woodland suitability group 17)

Mattapex soils, 15 to 30 percent slopes (MxE).—These steep soils have a surface layer of variable texture. Included with them are a few areas that are actively eroding but are too small to be mapped separately.

These soils should not be used for crops, though some areas can be used for hay or limited grazing. Areas that have not been cleared should be kept as woodland. Where the soils occur in blufflike areas along or near major streams, they have been cleared and are used for homesites and similar purposes. (Capability unit VIe–2; woodland suitability group 9)

Mixed Alluvial Land

Mixed alluvial land (My) occupies the flood plain, or bottom land, along many streams and rivers in this county. The material lacks distinct or uniform soil characteristics and cannot be identified by soil series or soil type. Within short distances the surface layer ranges from sand to loam or silt loam in texture and mainly from light gray to dark gray in color. In places where much organic matter has accumulated, however, the surface layer is black. In most areas drainage is poor, but there are some areas that are better drained. Included in mapping are some sandbars that are gravelly and above water most of the time.

Because this land type is so variable and commonly is so wet, not much of it is used for farming. Most areas are subject to yearly flooding and are therefore not suitable for crops or for improved pasture. Many areas make good sites for ponds (fig. 6). (Capability unit VIw–1, drainage group 12; woodland suitability group 2)

Figure 6.—Clearing an area of Mixed alluvial land for a 4½-acre pond. When completed, the pond will hold 17.2 acre-feet of water.

Othello Series

The Othello series consists of poorly drained soils on uplands that developed in silty deposits underlain by beds of sandy material.

In cultivated areas these soils have a plow layer of dark grayish-brown, crumbly loam or silt loam. To a depth of about 29 inches, the subsoil is light-gray or light olive-gray, light silty clay loam that is prominently mottled with shades of brown. The subsoil is weakly platy in the lower part and is sticky and plastic. Below it is a thin transitional layer of compact sandy loam that is gray mottled with strong brown. This layer is underlain by a substratum of loose loamy sand that is light gray but has streaks of yellowish brown.

Except in areas that have been limed, the Othello soils are very strongly acid or extremely acid. Areas that remain wooded have a thin, dark-gray surface layer and a fairly thin, gray to light-gray subsurface layer. In some places the substratum contains thin layers of silt, clay, or sandy clay and, in these places, is less sandy than is typical in Othello soils.

The Othello soils are not so well drained as the Matapeake, Mattapex, and Bertie soils, but they are better

drained than the Portsmouth soils. However, all of these soils developed in the same kind of silty mantle. The Othello soils have a profile similar to that of the Elkton and Fallsington soils, but the subsoil is dominantly silt in the Othello soils, is fine silty clay or clay in the Elkton soils, and is sandy clay loam in the Fallsington soils.

The Othello soils are extensive in Queen Annes County and are agriculturally important. Most of their acreage is in the western third of the county, where they occur closely with the Matapeake and the Mattapex soils. The Othello soils generally are not hard to drain, and if drained they can be used for most of the common crops. Because they are wet, however, their use for nonfarming purposes is severely limited.

Othello silt loam, 0 to 2 percent slopes (ObA).—This soil is extensive in Queen Annes County, especially in the southern and western parts and on Kent Island. Erosion normally is only a slight hazard, but artificial drainage is needed for nearly all crops. Drained areas are well suited to corn, soybeans, hay, and pasture. In addition, the soil is well suited to loblolly pine and some hardwoods. (Capability unit IIIw–7; drainage group 8–1A; irrigation group 13; woodland suitability group 10)

Othello silt loam, 2 to 5 percent slopes, moderately eroded (ObB2).—This soil has more rapid runoff and is more susceptible to erosion than Othello silt loam, 0 to 2 percent slopes. In some areas a significant part of the original surface layer has been washed away. The soil is poorly drained and slowly permeable, however, and internal drainage is the most important management problem. Further erosion is not a serious hazard if clean-tilled crops are rotated with hay or other close-growing crops. (Capability unit IIIw–7; drainage group 8–1A; irrigation group 13; woodland suitability group 10)

Othello and Elkton soils, 5 to 10 percent slopes, moderately eroded (OeC2).—This mapping unit consists either of Othello soils or of Elkton soils. Some areas mapped are only Othello soils, and others are only Elkton soils, but both kinds are too inextensive to be mapped separately. The surface layer is loam or silt loam. Included in mapping are a few small areas where the surface layer is somewhat more sandy than normal.

Because runoff is rapid, erosion is the main hazard on these moderately sloping soils, but drainage also is needed if the soils are to be used fully for agriculture. Ditches are especially suitable, for they drain the subsoil and also collect and divert runoff. Although these soils are best kept in close-growing crops much of the time, corn or soybeans can be used in a long rotation. (Capability unit IIIe–13; irrigation group 13; woodland suitability group 10)

Plummer Series

In the Plummer series are poorly drained soils on uplands that formed in beds of sandy material. They are primarily gray in color and are mottled nearly to the surface with shades of brown, an indication that drainage and aeration are poor. At a depth of 4 to 5 feet they are commonly underlain by material that is finer textured than that in the layers above.

In undisturbed Plummer soils the surface layer of grayish-brown or brownish-gray loose loamy sand extends to a depth of about 10 inches. Between 10 and about 28 inches is light olive-gray, loose loamy sand that is distinctly mottled with yellowish brown. Below this layer is light-gray loose sand that is coarser textured than the material above and is mottled with grayish brown. Abruptly below a depth of about 46 inches is light-gray sandy loam that is streaked with grayish brown. This layer is sticky and permanently wet.

Unless the Plummer soils have been limed, they are extremely acid. Lime must be used with care, however, on these sandy soils. Cultivated areas have a plow layer that is light gray and, at the surface, is almost white when dry.

The Plummer soils developed in the same kind of sandy material as the better drained Galestown, Lakeland, and Klej soils. Because they have a high water table, except in extremely dry periods, they are saturated to the surface much of the time and, in places, are ponded for considerable periods.

The Plummer soils have a small total acreage in Queen Annes County and are mostly in scattered areas in the extreme northern part. They are not productive and generally are of little importance to agriculture.

Plummer loamy sand (Pd).—This is the only Plummer soil mapped in the county. It is level or nearly level and commonly occupies slight depressions. The soil is sandy, very strongly acid, and low in productivity. Drainage is the most important management problem because undrained areas are of little use, except as woodland or for wildlife.

This soil is easy to work, even when dry or fairly wet, and it is generally not difficult to drain. Areas that are drained can be used for corn, truck crops, or home gardens. These gardens are fairly productive if they are carefully and heavily fertilized and otherwise are well managed. (Capability unit IVw–6; drainage group 9–1; irrigation group 1; woodland suitability group 10)

Pocomoke Series

The Pocomoke series consists of very poorly drained soils that developed on uplands in beds of sand, silt, and clay. These soils have a surface layer of black or nearly black sandy loam or loam and a subsoil of sandy clay loam or heavy sandy loam that is underlain by much sandier material.

In wooded areas the surface layer is black, crumbly loam or sandy loam about 10 inches thick. Beneath this is about 4 inches of material that is similar to the surface layer but is gray or dark gray. The upper subsoil is olive-gray heavy sandy loam that is prominently mottled with yellowish brown. The lower subsoil, to a depth of about 26 inches, is light-gray, firm, light sandy clay loam that is mottled with yellowish brown and gray and is sticky. Below the subsoil is light brownish-gray, loose loamy sand that is permanently wet and is more grayish as the depth increases.

The Pocomoke soils are very strongly acid or extremely acid unless they have been limed. In some places, particularly those in cultivation, the surface layer is dark gray or very dark gray instead of black and contains somewhat less organic matter. In places there are strong-brown to reddish-brown mottles at any depth below the surface. Some areas of Pocomoke soils are more sandy throughout than others.

The Pocomoke soils developed in the same kind, or about the same kind, of material as the Sassafras, Woodstown, and Fallsington soils, but they are more poorly drained than those soils. In many respects the Pocomoke soils closely resemble the Portsmouth soils, but they are sandier throughout and formed in much less silty material. Superficially, the Pocomoke soils resemble the Johnston soils, but they are on uplands instead of flood plains and have a more strongly developed subsoil.

The Pocomoke soils are fairly extensive in the eastern and northeastern parts of the county. Although they are agriculturally important, they are much too wet for some nonfarm uses, and fairly large areas are still wooded. Areas that have been cleared and drained can be used for most of the common crops.

Pocomoke loam (Pk).—This is the most extensive Pocomoke soil in Queen Annes County. Most of it is nearly level, but a few acres have slopes of as much as 2 percent. Drainage is very poor and must be improved before the soil can be farmed. If the soil is adequately drained, it is suited to corn, soybeans, some kinds of hay crops, and pasture. In wooded areas there are some good stands of loblolly pine, but wetland hardwoods are more common. Loblolly pine on this soil is satisfactory for timber or pulpwood. (Capability unit IIIw–7; drainage group 9–3A; irrigation group 13; woodland suitability group 1)

Pocomoke sandy loam (Pm).—This nearly level soil is used for the same kinds of crops as Pocomoke loam. Because it is somewhat sandier throughout, it is easier to work, is somewhat less difficult to drain, and can be drained by ditches or tile lines that are a little more widely spaced. (Capability unit IIIw–6; drainage group 9–3B; irrigation group 9; woodland suitability group 1)

Portsmouth Series

The Portsmouth series consists of very poorly drained soils on uplands that developed in silty material underlain by sandy deposits. These soils have a black, silty surface layer and a mottled gray silty clay loam subsoil.

In areas of wet woodland, the Portsmouth soils have a surface layer of black, crumbly silt loam, about 11 inches thick, that has a high content of organic matter. This layer is underlain by a thin, slightly finer textured subsurface layer that is very dark gray. The upper subsoil of dark olive-gray, firm silty clay loam is distinctly mottled with light gray and brown. The lower subsoil is plastic and sticky, firm, heavy silty clay loam that is light olive gray mottled with white and strong brown. Below a depth of about 37 inches is a light-gray, very sandy layer with streaks of grayish brown.

These soils are extremely acid and are almost mucky in undisturbed areas. In cultivated areas the plow layer is black or very dark gray. In places a thin transitional layer of sandy clay loam occurs between the lower subsoil and the substratum.

The Portsmouth soils developed in the same kind of material as the Matapeake, Mattapex, Bertie, and Othello soils, but they are more poorly drained than those soils. Portsmouth soils are similar to Pocomoke soils, but they are distinctly finer textured in the surface layer and subsoil and generally are more difficult to drain. The Portsmouth soils are not so fine textured in the subsoil and are not so wet and rich in organic matter as the Bayboro soils.

The Portsmouth soils are not extensive in Queen Annes County and are mostly in the east-central part, near Barclay and Ingleside. Only scattered small areas occur elsewhere. They are good agricultural soils if they are drained and properly limed and fertilized.

Portsmouth silt loam (Po).—This is the only Portsmouth soil in the county. It is locally important, but most of the small acreage is still in wetland forest. Because the soil is difficult to drain, closely spaced ditches are commonly required. (Capability unit IIIw–7; drainage group 9–4A; irrigation group 12; woodland suitability group 1)

Sassafras Series

In the Sassafras series are deep, well-drained soils that developed on uplands in deposits of sand, silt, and clay. These soils are characterized by a sandy or loamy surface layer and a brown to yellowish-brown sandy clay loam subsoil.

Undisturbed Sassafras soils have a very thin, dark grayish-brown surface layer and a fairly thick, grayish-brown subsurface layer. Both of these layers are very crumbly loam or sandy loam. The upper subsoil is somewhat sticky, yellowish-brown, crumbly loam or light sandy clay loam. The lower subsoil, to a depth of about 43 inches, is strong-brown, firm sandy clay loam that is sticky and plastic. Below the subsoil is yellowish-brown, very crumbly to loose loamy sand.

The Sassafras soils normally are very strongly acid or extremely acid, but most cultivated areas have been limed. The plow layer ordinarily is dark grayish brown. In areas at lower elevations near streams, the subsoil generally is sandier and less sticky than it is elsewhere. On some of the older uplands, there is a layer of transition between the subsoil and the substratum. This layer is firm, brittle sandy loam that is somewhat variegated in color. The depth to the substratum is less in some areas than in others.

The Sassafras soils have coarser sand grains and are more sandy in both the surface layer and subsoil than the otherwise similar Matapeake soils, which developed in much siltier material. The Sassafras soils are better drained than the Woodstown, Fallsington, and Pocomoke soils, though all developed in similar material.

In this county the Sassafras soils occupy 70,137 acres, which is almost one-third of the total land area. They occur in all parts of the county and are especially dominant east and north of Wye Neck, Queenstown, and Tilghman Neck. These soils are used for all types of farming and also are highly suitable as woodland. Drainage is not needed, and crops benefit from irrigation in dry periods.

Except on steep slopes, the Sassafras soils have only slight limitations affecting their use as homesites or as drainage fields for septic tanks. They are a good source of construction material for roads, embankments, and other engineering uses.

Sassafras loam, 0 to 2 percent slopes (SaA).—This nearly level soil is excellent for all purposes and is one of the more important agricultural soils of the county. It is well drained, generally supplies adequate moisture to

plants, and retains plant nutrients well. Because limitations are few, only ordinary good practices are needed in management. (Capability unit I–4; irrigation group 13; woodland suitability group 7)

Sassafras loam, 2 to 5 percent slopes, moderately eroded (SaB2).—This soil has more rapid runoff than Sassafras loam, 0 to 2 percent slopes, and it is more likely to erode if left unprotected. In places it has lost a good part of its original surface layer through erosion. To control further loss of soil, crops should be grown in good rotations, preferably in contour strips. If the soil is well managed, it is excellent for all uses and can be highly productive. (Capability unit IIe–4; irrigation group 13; woodland suitability group 7)

Sassafras loam, 5 to 10 percent slopes, moderately eroded (SaC2).—Erosion is a much greater hazard on this soil than on Sassafras loam, 0 to 2 percent slopes, and more careful management is needed to control further soil losses. Needed are longer rotations of crops grown in narrow strips along the contour. Under good management, the soil can be regularly cultivated to any of the common crops. (Capability unit IIIe–4; irrigation group 13; woodland suitability group 8)

Sassafras loam, 5 to 10 percent slopes, severely eroded (SaC3).—Most of the original surface layer of this soil has been removed through erosion. In many places the subsoil is exposed, or some of it is mixed with the remaining surface layer through plowing to a normal depth. Consequently, the productivity has been lowered, and the hazard of further erosion is severe. This soil should be carefully managed by farming it in long rotations or by keeping it in hay, pasture, or similar vegetation most of the time. In areas that have favorable air drainage, the soil is well suited to orchards if it is protected by close-growing cover. (Capability unit IVe–3; irrigation group 13; woodland suitability group 13)

Sassafras loam, 10 to 15 percent slopes, moderately eroded (SaD2).—Although this strongly sloping soil is only moderately eroded, it is highly susceptible to further erosion if it is regularly cultivated. For this reason, a good use for the soil is woodland. Cleared areas can be safely used for tilled crops only occasionally and snould be kept in hay, pasture, or sodded orchards most of the time. (Capability unit IVe–3; irrigation group 13; woodland suitability group 8)

Figure 7.—**A stand of crimson clover on Sassafras sandy loam, 0 to 2 percent slopes, on a farm near Sudlersville. Pointer shows nodules of nitrogen-fixing bacteria on the roots.**

Sassafras loam, 10 to 15 percent slopes, severely eroded (SaD3).—Erosion has severely damaged this soil, and the hazard of further erosion is so great that clean-tilled crops should not be grown. The soil is suited to permanent hay or to permanent pasture that is carefully grazed, and some areas can be safely used for sodded orchards. (Capability unit VIe–2; woodland suitability group 13)

Sassafras loam, 15 to 30 percent slopes (SaE)—.This steep soil is little affected by erosion because most of it remains in forest or other permanent cover. Some areas on bluffs above rivers and bays have been cleared for homesites and are kept in lawns or are otherwise protected. Crops cannot be safely grown on this soil, but pasture is suitable if it is carefully grazed. Sodded orchards also are suitable if they are well managed. (Capability unit VIe–2; woodland suitability group 9)

Sassafras sandy loam, 0 to 2 percent slopes (SfA).—This soil has almost no limitations that restrict its use in agriculture. It has good drainage but retains moisture well, and it is so nearly level that erosion is not a hazard. The soil is among the best in the county and can be used for all crops, including high-quality hay and pasture. Figure 7 shows an excellent stand of crimson clover in an area of this soil about 2 miles north of Sudlersville. (Capability unit I–5; irrigation group 9; woodland suitability group 7)

Sassafras sandy loam, 2 to 5 percent slopes, moderately eroded (SfB2).—This is the most extensive soil in the county and, in many ways, the most important for agriculture. It is well drained and holds moisture and plant nutrients well. It is more susceptible to erosion than Sassafras sandy loam, 0 to 2 percent slopes, and in most areas it has had a large part of its surface layer washed away. Included in mapped areas are a few severely eroded spots.

This soil generally has long, smooth slopes that are well suited to contour tillage and stripcropping, but some areas have a complex sinkhole relief. Controlling erosion is the main problem in management. (Capability unit IIe–5; irrigation group 9; woodland suitability group 7)

Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded (SfC2).—This soil generally has smooth, fairly long, regular slopes, though in some places there are small sinks known locally as whale wallows. The soil is readily penetrated by air, water, and roots (fig. 8).

Wooded areas of this soil have been little affected by erosion. In cultivated areas, where erosion has been moderate, further losses can be controlled by using fairly long rotations that keep the surface covered with sod or other close-growing crops much of the time and, where possible, by cultivating and stripcropping on the contour. (Capability unit IIIe–5; irrigation group 9; woodland suitability group 8)

Sassafras sandy loam, 5 to 10 percent slopes, severely eroded (SfC3).—More of the original surface layer has been lost from this soil than from Sassafras sandy loam, 5 to 10 percent slopes, moderatley eroded. The subsoil is exposed in some places, and only a small part of the

original surface layer remains in others (fig. 9). Plowing, even to a normal depth, is mainly in the subsoil.

Clean-tilled crops should be grown on this soil only in strips along the contour and only in a long rotation that includes sod or other close-growing crops most of the time. (Capability unit IVe-5; irrigation group 9; woodland suitability group 13)

Sassafras sandy loam, 10 to 15 percent slopes, moderately eroded (SfD2).—This strongly sloping soil has lost a considerable part of its original surface layer in places, and it is likely to erode further unless it is carefully protected and managed. Some of the less eroded areas are still wooded and, if possible, should be kept in trees. (Capability unit IVe-5; irrigation group 9; woodland suitability group 8)

Sassafras sandy loam, 10 to 15 percent slopes, severely eroded (SfD3).—Because this soil is highly susceptible to further erosion, it should not be used for clean-tilled crops. If it is well managed, it is suited to plants grown for hay or pasture, and it can be safely used for orchards if the surface is protected by a close-growing cover crop or a sod crop. Some areas are suitable for planting to trees, particularly pine. (Capability unit VIe-2; woodland suitability group 13)

Sassafras sandy loam, 15 to 30 percent slopes (SfE).—This steep soil has a somewhat thinner surface layer and subsoil than the less strongly sloping Sassafras soils. It has not been subjected to accelerated erosion, chiefly because nearly all of it remains wooded. In only a few scattered areas has soil been recently lost. Most areas that are wooded should remain so, but this soil can be used for sod crops or for sodded orchards if it is exceptionally well managed. (Capability unit VIe-2; woodland suitability group 9)

Sassafras sandy loam, 15 to 30 percent slopes, severely eroded (SfE3).—Because this soil has not been so well protected as Sassafras sandy loam, 15 to 30 percent slopes, it has lost practically all of its original surface layer and, in places, much of its subsoil through erosion. Consequently, the soil is of little use for most types of farming. If it is reforested or is planted to permanent sod or other protective vegetation, it can be used for wildlife or recreation, can provide limited grazing, or perhaps can furnish some woodland products. (Capability unit VIIe-2; woodland suitability group 13)

Sassafras sandy loam, 30 to 60 percent slopes (SfF).—This soil is the steepest in the county and occupies short, very steep slopes that are almost like bluffs. It occurs along streams, rivers, and some of the bayfront and, in most places, has not been cleared. The areas that have been cleared generally are adjacent to or are parts of homesites and are kept in sod or other protective cover. Only a few small areas have been damaged through erosion.

This soil is not suitable for cropping. It could be used for carefully controlled grazing, but that use probably would not be economical. (Capability unit VIIe-2; woodland suitability group 9)

Swamp

Swamp (Sw) consists of fresh-water areas that are under water a large part of the year. The soil material has not been classified and is made up of sand, silt, clay, muck, peat, or a mixture of any of these. Because the material is wet, it is not farmed.

Most areas of Swamp are wooded, but they commonly produce little usable timber and are too wet for normal management. Generally, they are suitable only as wildlife habitat. (Capability unit VIIw-1; woodland suitability group 21)

Tidal Marsh

Tidal marsh (Tm) has not been examined in detail, but its soil material ranges from sand to clay and, in some places, is mucky or peaty. Besides being more or less salty, some areas apparently contain a fairly large amount of sulfur compounds. If these areas were reclaimed and drained, the sulfur compounds would be oxidized to other compounds that normally are highly toxic to crops and to most other plants. All areas of Tidal marsh are subject to inundation when storms occur or when tides are unusually high. Areas that extend inland along the Chester River and other major rivers in the county are less affected by salt than areas that are close to the open waters of Chesapeake Bay.

Tidal marsh is of little use in agriculture at the present time because it is not suitable for pasture, crops, or timber. Some areas were formerly mowed for wild salt hay, but this practice is no longer common. About the only practical uses are for wildlife and recreation. (Capability unit VIIIw-1; woodland suitability group 21)

Figure 8.—**Corn roots have grown to a depth of 17 inches in this area of Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded, near Sudlersville.**

Figure 9.—In the foreground is a compact, barren area of Sassafras sandy loam, 5 to 10 percent slopes, severely eroded, that has lost most of its original surface layer through erosion. In the background is a farm pond bordered by a hedge of multiflora rose.

Woodstown Series

In the Woodstown series are moderately well drained soils that developed on uplands in deposits of sand, silt, and clay. These soils are more or less sandy throughout and have a sandy clay loam subsoil. Because drainage is impeded, the lower subsoil is mottled.

Undisturbed Woodstown soils have a thin, dark grayish-brown surface layer and a fairly thick, light yellowish-brown subsurface layer, both of which are crumbly loam or sandy loam. At a depth of about 13 to 24 inches, the upper subsoil is yellowish-brown, sticky fine sandy clay loam. Between the depths of 24 and about 34 inches, the lower subsoil is light yellowish-brown fine sandy clay loam that is mottled with grayish brown and strong brown. Although this layer is fairly firm, it is also sticky and slightly plastic. Below the subsoil is a very sandy layer that is variegated pale brown, strong brown, yellow, and gray and is commonly stratified.

Like most of the other soils of the county, the Woodstown soils are very strongly acid or extremely acid unless they have been limed. In cultivated areas the plow layer normally is grayish brown.

The Woodstown soils developed in the same kind of material as the better drained Sassafras soils and the more poorly drained Fallsington and Pocomoke soils. The Woodstown soils are similar to the Mattapex soils in appearance, but they are much less silty and more sandy both in the surface layer and the subsoil. Although the Woodstown soils are much less sandy than the Klej soils, particularly in the subsoil, they generally resemble those soils in color and drainage.

The Woodstown soils are extensive in nearly all parts of the county and occur closely with the Sassafras and Fallsington soils. They are used for most crops but are not well suited to alfalfa, which is subject to damage from frost heaving in winter. Seasonal wetness also limits the use of these soils for many nonfarm purposes.

Woodstown loam, 0 to 2 percent slopes (WdA).—This nearly level soil is subject to only slight erosion, but it has impeded drainage that is the most important problem in management. Because the soil is wet in winter and much of the time in spring, the planting of crops may be delayed for several days beyond the normal dates.

Excess water can be removed from this soil by use of tile lines or open ditches. If drainage is improved and if lime and fertilizer are applied in proper amounts, the soil can be used for most of the common crops. (Capability unit IIw–1; drainage group 2–A; irrigation group 13; woodland suitability group 3)

Woodstown loam, 2 to 5 percent slopes, moderately eroded (WdB2).—This gently sloping soil is more easily

drained than Woodstown loam, 0 to 2 percent slopes, but it is more susceptible to erosion. Most areas have had a significant amount of the original surface layer washed away, and a few scattered areas are severely eroded. Slopes generally are regular and smooth, though they are uneven or hummocky in some places. (Capability unit IIe–16; drainage group 2–A; irrigation group 13; woodland suitability group 3)

Woodstown sandy loam, 0 to 2 percent slopes (WoA).—Because this nearly level soil dries out slowly, planting is frequently delayed, especially when spring is unusually wet. Removing excess water is the most important management problem. The erosion hazard is only slight.

If this soil is drained, limed and fertilized, and otherwise well managed, it is well suited to most crops commonly grown in the county. (Capability unit IIw–5; drainage group 2–B; irrigation group 9; woodland suitability group 3)

Woodstown sandy loam, 2 to 5 percent slopes, moderately eroded (WoB2).—This soil has better surface drainage than Woodstown sandy loam, 0 to 2 percent slopes, but it has more rapid runoff and is subject to more erosion. Some areas have lost an appreciable amount of the original surface layer, and erosion has been severe in a few small, widely scattered areas. In addition, there are a few sinks or depressions in areas of this soil. Although excess surface water commonly is not a problem, tiling or a similar drainage practice is needed to drain the subsoil in many places. (Capability unit IIe–36; drainage group 2–B; irrigation group 9; woodland suitability group 3)

Woodstown sandy loam, 5 to 10 percent slopes, moderately eroded (WoC2).—Because of the serious erosion hazard, most areas of this soil have lost a significant amount of their surface layer. Included in areas mapped are small spots that have a surface layer of loam instead of sandy loam and a few acres that are severely eroded.

This soil is somewhat limited in use for agriculture, unless erosion is controlled by planting the crops in strips on the contour and by disposing of excess water. (Capability unit IIIe–36; irrigation group 9; woodland suitability group 9)

Woodstown sandy loam, 10 to 15 percent slopes (WoD).—Most areas of this soil are used as urban or rural homesites and, consequently, are mainly in trees or grass. Only a few areas are used for farming. Because slopes are strong, excess water generally is not a problem in cultivated areas. In residential areas, however, it disrupts septic-tank systems in wet periods, makes basements wet, and causes frost heaving in roads and driveways.

If this soil is used for crops, protective measures are needed to control erosion. Long rotations should be used, and crops should be grown in strips on the contour. (Capability unit IVe–5; irrigation group 9; woodland suitability group 9)

Woodstown sandy loam, 15 to 30 percent slopes (WoE),—Practically all of this steep soil is in nonfarm uses and probably should remain so. Included are areas that have lost part of their original surface layer because they have not been well protected. Generally, about the only safe use for this soil in farming is carefully controlled grazing. (Capability unit VIe–2; woodland suitability group 9)

Use and Management of the Soils

This part of the report has several main subsections. The first explains the system of capability classification used by the Soil Conservation Service. It defines the capability units of Queen Annes County, suggests management practices for each capability unit, describes basic practices that are suitable for all the soils in the county, and given estimates of average yields of the common crops. Other subsections tell about the use of soils as woodland, discuss wildlife, describe engineering uses of soils, and discuss urban, suburban, and recreational uses, including the use of the soil survey in community planning.

Capability Groups of Soils

The capability classification is a grouping that shows, in a general way, how suitable soils are for most kinds of farming. It is a practical grouping based on limitations of the soils, the risks of damage when they are used, and the way they respond to treatment.

In this system all the kinds of soil are grouped at three levels, the capability class, subclass, and unit. The eight capability classes in the broadest grouping are designated by the Roman numerals I through VIII. In class I are the soils that have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. In class VIII are soils and landforms so rough, shallow, salty, or otherwise limited that they do not produce worthwhile yields of crops, forage, or wood products.

The subclasses indicate major kinds of limitations within the classes. Within most of the classes there can be as many as four subclasses. The subclass is indicated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, as for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* means that water in or on the soil will interfere with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, very sandy, droughty, or stony; and *c*, used in only some parts of the country, indicates that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few or no limitations. Class V can contain, at the most, only subclasses *w*, *s*. and *c*, because the soils in it are subject to little or no erosion but have other limitations that restrict their use largely to pasture, range, woodland, or wildlife.

Within the subclasses are the capability units, groups of soils enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally identified by numbers assigned locally; for example, IIe–4, IIIw–7, or IVs–1.

Soils are classified in capability classes, subclasses, and units in accordance with the degree and kind of their

permanent limitations; but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soil; and without consideration of possible but unlikely major reclamation projects. Queen Annes County has approximately 9,018 acres of soils in class I; 116,331 acres in class II; 87,014 acres in class III; 7,322 acres in class IV; 11,739 acres in class VI; 1,033 acres in class VII; and 6,183 acres in class VIII. There are no class V soils in the county.

The soils of Queen Annes County have been grouped into the following classes, subclasses, and capability units. The numbers of the capability units in the following list are not consecutive, because a statewide system for numbering capability units is used, and only some of these units are represented in this county.

Class I.—Soils that have few limitations that restrict their use.
- (No subclasses)
  - Unit I-4.—Deep, well-drained, nearly level soils that are medium textured.
  - Unit I-5.—Deep, well-drained, nearly level soils that are moderately coarse textured.

Class II.—Soils that have some limitations that reduce the choice of plants or that require moderate conservation practices.
- Subclass IIe.—Soils subject to moderate erosion if they are not protected.
  - Unit IIe-4.—Deep, well-drained, gently sloping soils that are medium textured.
  - Unit IIe-5.—Deep, well-drained, gently sloping soils that are moderately coarse textured.
  - Unit IIe-13.—Moderately well drained, gently sloping, medium-textured soils that have a slowly permeable, clayey subsoil and are moderately limited by wetness.
  - Unit IIe-16.—Moderately well drained, gently sloping, medium-textured soils that have slow to moderate permeability in the subsoil and are moderately limited by wetness.
  - Unit IIe-36.—Moderately well drained, gently sloping, moderately coarse textured soils that have a moderately slowly or moderately permeable subsoil and are moderately limited by wetness.
- Subclass IIw.—Soils that have moderate limitations because of excess water.
  - Unit IIw-1.—Moderately well drained, nearly level, medium-textured soils that have a slowly permeable to moderately permeable subsoil.
  - Unit IIw-5.—Moderately well drained, nearly level, moderately coarse textured soils that have a moderately slowly or moderately permeable subsoil.
  - Unit IIw-8.—Moderately well drained, nearly level, medium-textured soils that have a slowly permeable subsoil.
- Subclass IIs.—Soils that have moderate limitations of moisture capacity or tilth.
  - Unit IIs-4.—Deep, well-drained, nearly level or gently sloping soils that have a thick, coarse-textured surface layer and a finer textured subsoil.

Class III.—Soils that have severe limitations that reduce the choice of plants, or require special conservation practices, or both.
- Subclass IIIe.—Soils subject to severe erosion if they are cultivated and not protected.
  - Unit IIIe-4.—Deep, well-drained, moderately sloping or somewhat rolling, medium-textured soils.
  - Unit IIIe-5.—Deep, well-drained, moderately sloping or somewhat rolling, moderately coarse textured soils.
  - Unit IIIe-13.—Poorly drained, moderately sloping or somewhat rolling, medium-textured soils that have a moderately slowly or slowly permeable subsoil and are severely limited by wetness.
  - Unit IIIe-16.—Moderately well drained, moderately sloping or somewhat rolling, medium-textured soils that have a moderately slowly or slowly permeable subsoil and are moderately limited by wetness.
  - Unit IIIe-33.—Deep, well-drained, moderately sloping or somewhat rolling soils that have a coarse-textured surface layer and a finer textured subsoil.
  - Unit IIIe-36.—Moderately well drained, sloping to somewhat rolling, moderately coarse textured soils that have a moderately permeable subsoil and are moderately limited by wetness.
- Subclass IIIw.—Soils that have severe limitations because of excess water.
  - Unit IIIw-1.—Somewhat poorly and poorly drained, medium-textured soils that have a moderately slowly permeable subsoil.
  - Unit IIIw-6.—Poorly drained and very poorly drained, moderately coarse textured soils that have a moderately permeable subsoil.
  - Unit IIIw-7.—Poorly drained and very poorly drained, medium-textured soils that have a moderately or moderately slowly permeable subsoil.
  - Unit IIIw-9.—Poorly drained and very poorly drained, medium-textured soils that have a slowly or very slowly permeable subsoil.
  - Unit IIIw-10.—Somewhat poorly drained and moderately well drained, coarse-textured soils that have a subsoil in which permeability is moderately rapid.
- Subclass IIIs.—Soils that have severe limitations of moisture capacity or tilth.
  - Unit IIIs-1.—Deep, somewhat excessively drained, nearly level or gently sloping soils that are coarse textured and rapidly permeable.

Class IV.—Soils that have very severe limitations that restrict the choice of plants, require very careful management, or both.
- Subclass IVe.—Soils subject to very severe erosion if they are cultivated and not protected.
  - Unit IVe-3.—Deep, well-drained, medium-textured soils that are moderately sloping and severely eroded or are strongly sloping.

Unit IVe-5.—Moderately well drained and well drained, moderately coarse textured and coarse textured soils that are moderately sloping and severely eroded or are strongly sloping.

Unit IVe-9.—Moderately well drained, medium-textured soils that either are strongly sloping or are moderately sloping and severely eroded, that have a moderately permeable or slowly permeable subsoil, and that are moderately limited by wetness.

Subclass IVw.—Soils that have very severe limitations for cultivation because of excess water.

Unit IVw-6.—Poorly drained, coarse-textured, moderately rapidly permeable soils.

Subclass IVs.—Soils that have very severe limitations of low moisture capacity or other soil features.

Unit IVs-1.—Deep, coarse-textured, nearly level to moderately sloping or somewhat rolling soils that are very rapidly permeable and somewhat excessively drained.

Class VI.—Soils that have severe limitations that make them generally unsuited to cultivation and that limit their use largely to pasture or range, woodland, or wildlife food and cover.

Subclass VIe.—Soils severely limited, chiefly by risk of erosion if protective cover is not maintained.

Unit VIe-2.—Well drained and moderately well drained soils that are steep or are strongly sloping and severely eroded.

Subclass VIw.—Soils severely limited by excess water and generally unsuitable for cultivation.

Unit VIw-1.—Nearly level, wet, mixed soil material that is subject to flooding.

Unit VIw-2.—Poorly drained, very wet, very slowly permeable soils.

Class VII.—Soils that have very severe limitations that make them unsuitable for cultivation without major reclamation and that restrict their use largely to grazing, woodland, or wildlife.

Subclass VIIe.—Soils very severely limited, chiefly by risk of erosion if protective cover is not maintained.

Unit VIIe-2.—Well drained and moderately well drained soils that are very steep or are strongly sloping to steep and severely eroded.

Subclass VIIw.—Soils very severely limited by excess water.

Unit VIIw-1.—Very wet, unclassified soil material.

Subclass VIIs.—Soils very severely limited by low moisture capacity or other soil features.

Unit VIIs-1.—Moderately sloping to steep, coarse-textured soils that are rapidly permeable and excessively drained.

Class VIII.—Soils and landforms having limitations that preclude their use for commercial production of plants and restrict their use to recreation, water supply, wildlife, or esthetic purposes.

Subclass VIIIw.—Extremely wet or marshy land.

Unit VIIIw-1.—Land regularly subject to flooding during high tides.

Subclass VIIIs.—Soil material that has little potential for the production of vegetation.

Unit VIIIs-2.—Almost bare, loose sand.

Unit VIIIs-4.—Land where soil has been removed.

Management by capability units

In this subsection each capability unit is briefly described and the soils in it are listed. Suggestions are given on how to use and manage the soils in each unit. As stated in the explanation of capability grouping, a capability unit consists of soils that are suitable for the same uses and produce about the same yields. Therefore, the soils need about the same management, though they may have formed in different ways and from different kinds of parent material.

CAPABILITY UNIT I-4

The soils in this unit are deep, nearly level, medium textured, and well drained. They are—

Matapeake loam, 0 to 2 percent slopes.
Matapeake silt loam, 0 to 2 percent slopes.
Matapeake silt loam, silty substratum, 0 to 2 percent slopes.
Sassafras loam, 0 to 2 percent slopes.

These soils occupy 6,102 acres and are the best for agriculture of any soils in the county. They retain moisture and plant nutrients well, and they are easy to work. Under good management they are suitable for intensive cultivation and are highly productive.

Corn, soybeans, and small grain are grown extensively. Vegetables, fruits, hay crops, and pasture crops are grown to a lesser extent. For high yields, the supply of plant nutrients must be kept high, lime should be applied as needed, and legumes and green-manure crops should be grown.

CAPABILITY UNIT I-5

In this unit are nearly level, moderately coarse textured soils that are deep and well drained. They are—

Matapeake fine sandy loam, 0 to 2 percent slopes.
Sassafras sandy loam, 0 to 2 percent slopes.

The soils of this unit cover 2,916 acres in the county. These soils are crumbly and easily worked, and they can be cultivated intensively over a long period of time. They are suited to the same crops as the soils of capability unit I-4, and they are perhaps better suited to truck crops and strawberries. They are somewhat more sandy than the soils in unit I-4, and they do not hold moisture and plant nutrients so well. Nevertheless, if a good supply of plant nutrients is maintained, yields should be just as high.

CAPABILITY UNIT IIe-4

In this unit are gently sloping, medium-textured soils that are deep and well drained. They are—

Matapeake loam, 2 to 5 percent slopes, moderately eroded.
Matapeake silt loam, 2 to 5 percent slopes, moderately eroded.
Matapeake silt loam, silty substratum, 2 to 5 percent slopes, moderately eroded.
Sassafras loam, 2 to 5 percent slopes, moderately eroded.

These soils have a total area of 17,622 acres in the county. They are similar to the soils of capability unit I-4, but they have stronger slopes, are moderately eroded, and are moderately susceptible to further erosion.

The soils of this unit require contour tillage and longer rotations for control of erosion, but otherwise they can be used and managed about the same way as the soils of unit I-4. The cropping system should include hay or other close-growing crops. These soils are excellent for orchards in areas where air drainage is adequate.

CAPABILITY UNIT IIe-5

Deep, gently sloping, well-drained, moderately coarse textured soils make up this unit. They are—

- Matapeake fine sandy loam, 2 to 5 percent slopes, moderately eroded.
- Sassafras sandy loam, 2 to 5 percent slopes, moderately eroded.

These soils occupy a total area of 38,453 acres in the county. They have moderate limitations to use because of the risk of erosion. Except for practices to control erosion, the soils have the same uses and require the same management as the soils of capability unit I–5. They need to be tilled on the contour and require longer rotations than the soils of unit I–5. In addition, close-growing crops should be included in the rotation.

CAPABILITY UNIT IIe-13

This unit consists of gently sloping, medium-textured, moderately well drained soils that have a slowly permeable, clayey subsoil and are moderately limited by wetness. The soils are—

- Keyport loam, 2 to 5 percent slopes, moderately eroded.
- Keyport silt loam, 2 to 5 percent slopes, moderately eroded.

These soils occupy 1,892 acres in the county. Although drainage is impeded and the subsoil is slowly permeable, runoff is rapid enough that protecting the surface from erosion is more important than improving drainage. The soils are too wet during some periods, however, and are too dry in others. Good management consists not only of practices that control erosion but also of practices that remove excess surface water. A good supply of plant nutrients must be maintained, and lime is required in many places. The soils are not well suited to alfalfa and similar crops that may be damaged by frost heaving in winter. They are well suited to corn, soybeans, hay crops, other than alfalfa, and pasture.

CAPABILITY UNIT IIe-16

The soils in this unit are gently sloping, medium textured, and moderately well drained. They have slow to moderately permeability in the subsoil and are moderately limited by wetness. They are—

- Butlertown silt loam, 2 to 5 percent slopes, moderately eroded.
- Mattapex loam, 2 to 5 percent slopes, moderately eroded.
- Mattapex silt loam, 2 to 5 percent slopes, moderately eroded.
- Woodstown loam, 2 to 5 percent slopes, moderately eroded.

The soils of this unit have a total area of 17,401 acres in the county. In drainage and in texture of the surface layer they are like the Keyport soils in capability unit IIe–13, but the soils in this unit are not so fine textured in the subsoil as those soils, and they can be drained by tiling. Use and management requirements are about the same for both units.

CAPABILITY UNIT IIe-36

In this unit are gently sloping, moderately coarse textured, moderately well drained soils that have a moderately slowly or moderately permeable subsoil and are moderately limited by wetness. They are—

- Mattapex fine sandy loam, 2 to 5 percent slopes, moderately eroded.
- Woodstown sandy loam, 2 to 5 percent slopes, moderately eroded.

These soils cover 4,857 acres in the county. They are similar to the soils in capability unit IIe–16, but they are somewhat more sandy, particularly in the plow layer. The soils in this unit are suited to the same uses as the soils in units IIe–13 and IIe–16, and they require much the same management, including measures for controlling erosion. However, they are easier to drain, to work, and to manage, though they do not retain plant nutrients quite so well. Fertility must be maintained for high yields.

CAPABILITY UNIT IIw-1

This unit consists of nearly level, medium-textured, moderately well drained soils that have a slowly permeable to moderately permeable subsoil. The soils are—

- Butlertown silt loam, 0 to 2 percent slopes.
- Mattapex loam, 0 to 2 percent slopes.
- Mattapex silt loam, 0 to 2 percent slopes.
- Woodstown loam, 0 to 2 percent slopes.

These moderately wet soils occupy 18,329 acres in the county. They are similar to the soils in capability unit IIe–16, but they are nearly level and are subject to little or no erosion. If drainage is adequate, the soils are suited to most crops commonly grown, but they are not well suited to alfalfa and similar crops that are damaged by frost heaving in winter. Tile or open ditches, properly spaced and installed, are needed to remove excess water in wet periods. The ditches should be shallow enough that they do not extend into the sandy substratum, because the sandy material tends to flow and to cave into the channels. A good supply of plant nutrients should be maintained, and lime is generally needed.

CAPABILITY UNIT IIw-5

In this unit are nearly level, moderately coarse textured soils that are moderately well drained and have a moderately slowly or moderately permeable subsoil. They are—

- Mattapex fine sandy loam, 0 to 2 percent slopes.
- Woodstown sandy loam, 0 to 2 percent slopes.

These soils have a total area of 5,967 acres in this county. They are sandier, particularly in the plow layer, and are more easily drained and worked than the soils in capability unit IIw–1. Yields tend to be somewhat lower on these soils, however, unless fertility is maintained at a high level.

Drainage is the most important management problem, but if the soils are drained, they tend to warm up more quickly in spring than most soils that have impeded drainage. Ditches used for carrying off excess water should not extend into the sandy substratum. Tile drainage is well suited.

CAPABILITY UNIT IIw-8

The soils in this unit are nearly level, medium textured, and moderately well drained. They have a slowly permeable subsoil. In the unit are—

- Keyport loam, 0 to 2 percent slopes.
- Keyport silt loam, 0 to 2 percent slopes.

These soils occupy 7,756 acres in Queen Annes County. Water infiltrates slowly and drains through the profile very slowly. The soils should be cultivated within only a very narrow range of moisture content, for the plow layer tends to pack after heavy rains. Drainage is the

most important management problem, but V-type ditches that are properly spaced are generally adequate for removing excess water. In most places tile is not suitable, because the subsoil is fine textured.

If these soils are drained, or are cultivated only when they are neither too wet nor too dry, and otherwise are well managed, they produce moderate to high yields of the crops commonly grown. Because the soils heave in winter, they are not well suited to alfalfa.

CAPABILITY UNIT IIs-4

This unit consists of deep, nearly level or gently sloping, well-drained soils that have a coarse-textured surface layer and a finer textured subsoil. The soils are—

Downer loamy sand, 0 to 2 percent slopes.
Downer loamy sand, 2 to 5 percent slopes.

These soils have a total area of 4,054 acres in the county. Their loamy sand surface layer is thick and friable, and their subsoil is thin, friable sandy clay loam that is underlain by sand at a depth of 24 to 30 inches. The soils are low in plant nutrients and content of organic matter and are moderately low in available moisture capacity.

These soils are well suited to most crops, and some areas can be used for sweetpotatoes and other truck crops (fig. 10). Where moisture is adequate, yields are fair to very good. Supplemental irrigation is desirable and is needed in dry periods, particularly for shallow-rooted annual crops.

CAPABILITY UNIT IIIe-4

In this unit are moderately sloping or somewhat rolling, medium-textured soils that are deep and well drained. They are—

Matapeake loam, 5 to 10 percent slopes, moderately eroded.
Matapeake silt loam, 5 to 10 percent slopes, moderately eroded.
Matapeake silt loam, silty substratum, 5 to 10 percent slopes, moderately eroded.
Sassafras loam, 5 to 10 percent slopes, moderately eroded.

These soils occupy 3,443 acres in the county. Because they are moderately sloping, they are susceptible to erosion. The soils are suited to about the same crops as the soils in capability units I-4 and IIe-4, and they produce about the same yields if good management is used. Longer rotations are needed, however, and hay or other close-growing crops should be grown much of the time.

These soils can be protected from further erosion by tilling them as little as possible, by tilling on the contour, and by planting sod crops in buffer strips. Sodded waterways that have suitable outlets are needed for safely disposing of excess water.

CAPABILITY UNIT IIIe-5

This unit consists of deep, moderately sloping or somewhat rolling soils that are moderately coarse textured and well drained. The soils are—

Matapeake fine sandy loam, 5 to 10 percent slopes, moderately eroded.
Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded.

These soils cover 4,845 acres in the county. They are similar to the soils in capability units I-5 and IIe-5, though they have stronger slopes and are more susceptible to erosion. The soils in this unit are more easily worked than those in capability unit IIIe-4, but they are suited to the same crops and require about the same management. Yields are somewhat lower, however, unless a good supply of plant nutrients is maintained.

CAPABILITY UNIT IIIe-13

Only Othello and Elkton soils, 5 to 10 percent slopes, moderately eroded, are in this unit. These moderately sloping or somewhat rolling soils are medium textured, poorly drained, and severely limited by wetness. They are in small areas that total 122 acres.

Because erosion is the main problem, these soils should be kept in close-growing crops much of the time, though corn and soybeans can be safely grown in a suitably long rotation. Improved drainage and protection from rapid runoff are needed. Tillage should be kept to the minimum, and ditches should be installed to drain the subsoil and to collect and divert runoff.

CAPABILITY UNIT IIIe-16

The soils in this unit are moderately sloping or somewhat rolling, medium textured, and moderately well drained. They have a moderately slowly or slowly permeable subsoil and are moderately limited by wetness. They are—

Butlertown silt loam, 5 to 10 percent slopes, moderately eroded.
Mattapex loam, 5 to 10 percent slopes, moderately eroded.
Mattapex silt loam, 5 to 10 percent slopes, moderately eroded.

These soils occupy only 726 acres in the county. In some respects they are similar to the soils in capability unit IIe-16, but they have stronger slopes and more rapid runoff, and they are more susceptible to erosion. Erosion can be controlled if runoff is collected in closely spaced diversions or tile interceptors and is removed through sodded waterways. Tilled crops can be safely grown in a 4-year rotation.

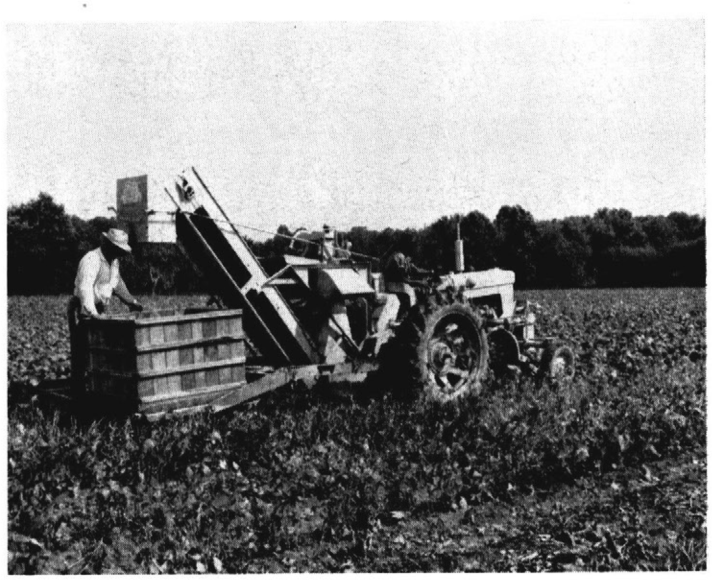

Figure 10.—**Harvesting snap beans on Downer loamy sand, 0 to 2 percent slopes, near the Chester River in the northern part of the county.**

CAPABILITY UNIT IIIe-33

The only soil in this unit is Downer loamy sand, 5 to 10 percent slopes. This moderately sloping or somewhat rolling soil is well drained and has a subsoil that is finer textured than the surface layer. The soil occupies only 363 acres in the county.

In most respects this soil is similar to the soils in capability units IIs-4, but it is more strongly sloping and should be kept in longer rotations. Erosion, the main problem in management, can be reduced by stripcropping and tilling on the contour. For good yields, however, a good supply of moisture and of plant nutrients must be maintained. Supplemental irrigation is desirable, especially in dry periods.

CAPABILITY UNIT IIIe-36

The only soil in this unit is Woodstown sandy loam, 5 to 10 percent slopes, moderately eroded. It is a moderately sloping or somewhat rolling soil that is moderately well drained, has a moderately permeable subsoil, and is moderately limited by wetness. It occupies 183 acres in the county.

Because this soil is more strongly sloping than the soils in capability unit IIe-36, it is more likely to erode if left unprotected. It is sandier, especially in the plow layer, than the soils in unit IIIe-16. It is more easily tilled than those soils, and excess water is more easily collected and removed, though the soil is slightly less productive unless fertility is kept high.

CAPABILITY UNIT IIIw-1

In this unit are medium-textured, somewhat poorly drained or poorly drained soils that have a moderately slowly permeable subsoil. They are—

- Bertie and Othello silt loams, 0 to 2 percent slopes.
- Bertie and Othello silt loams, 2 to 5 percent slopes, moderately eroded.

These soils occupy 781 acres in the county. The Bertie soils, which are dominant, are somewhat poorly drained, and the Othello soils are poorly drained. All of these soils are moderately wet or wet, but they can be drained easily by tile or open ditches. If drainage is provided, good yields can be obtained from many kinds of crops, though wetness generally delays planting. Erosion is a hazard in sloping areas.

CAPABILITY UNIT IIIw-6

This unit consists of moderately coarse textured, poorly drained and very poorly drained soils that have a moderately permeable subsoil. The soils are—

- Fallsington sandy loam, 0 to 2 percent slopes.
- Fallsington sandy loam, 2 to 5 percent slopes.
- Pocomoke sandy loam.

These soils occupy a total area of 17,440 acres in the county. The Fallsington soils are poorly drained and have a gray surface layer. The Pocomoke soil is very poorly drained and has a very dark gray to black surface layer that is high in organic-matter content.

Unless these soils are artificially drained, their use for crops is limited. Tile drainage is well suited, but open ditches are difficult to maintain because these sandy soils tend to cave and flow into the channels. Yields of many crops are good if drainage is established and if fertilizer and lime are added. The soils are not well suited to alfalfa and lespedeza, and they are not used extensively for small grain.

CAPABILITY UNIT IIIw-7

Poorly drained and very poorly drained, medium-textured soils are in this unit. Their subsoil is moderately or moderately slowly permeable. The soils are—

- Bibb silt loam.
- Fallsington loam, 0 to 2 percent slopes.
- Fallsington loam, 2 to 5 percent slopes.
- Johnston loam.
- Othello silt loam, 0 to 2 percent slopes.
- Othello silt loam, 2 to 5 percent slopes, moderately eroded.
- Pocomoke loam.
- Portsmouth silt loam.

These soils have a total area of 35,691 acres. The Bibb and the Johnston soils are on flood plains and must be protected from overflow.

The soils in this unit have a less sandy surface layer and a somewhat finer textured subsoil than the soils in capability unit IIIw-6. They are slightly more difficult to drain than the soils in capability unit IIIw-6, but where they are drained, they can be expected to produce higher yields. Tile and V-type ditches are suitable for improving drainage, but these should be more closely spaced than on the soils in unit IIIw-6. The ditches should not be deep enough to penetrate the sandy substratum. Fertilizer is needed, and the soils ought to be tested frequently to determine the need for lime.

CAPABILITY UNIT IIIw-9

In this unit are medium-textured soils that are poorly drained and very poorly drained and have a slowly or very slowly permeable subsoil. They are—

- Bayboro silt loam.
- Elkton loam.
- Elkton silt loam, 0 to 2 percent slopes.
- Elkton silt loam, 2 to 5 percent slopes, moderately eroded.

These soils occupy 20,276 acres in the county. The poorly drained Elkton soils have a gray surface layer. The very poorly drained Bayboro soil has a very dark gray or black surface layer that is high in organic-matter content.

The soils in this unit are hard when dry and sticky when wet, and they can be cultivated within only a narrow range of moisture content. In addition, their fine-textured, slowly permeable subsoil makes them difficult to drain. Field ditches generally are needed to remove excess water. If the soils are drained, they are suited to corn, soybeans, grasses, and other crops, but they require fertilizer and moderate to large amounts of lime. They are not suited to alfalfa or small grain, but they could be used more extensively for pasture.

CAPABILITY UNIT IIIw-10

The soils in this unit are coarse textured and somewhat poorly drained or moderately well drained. Permeability is moderately rapid in the subsoil. The soils are—

- Klej loamy sand, 0 to 2 percent slopes.
- Klej loamy sand, 2 to 5 percent slopes.

These soils occupy only 210 acres in the county. They have impeded drainage, and they are strongly acid and low in plant nutrients. In wet periods the soils are wet, but in dry periods they store little moisture that is

available to plants. Surface drainage is needed if cultivated crops are grown, but ditches are difficult to maintain because these sandy soils flow when they are saturated. Tile drains are more satisfactory. Good yields can be obtained by maintaining a good supply of plant nutrients and by irrigating during dry periods.

If they are well managed, the soils in this unit are well suited to the crops commonly grown in the county. They are used mainly for corn, soybeans, and vegetables grown commercially or for home gardens. Yields are somewhat lower, however, than on some of the better agricultural soils in the county.

CAPABILITY UNIT IIIs-1

In this unit are deep, nearly level or gently sloping, coarse-textured soils that are rapidly permeable and somewhat excessively drained. They are—

Galestown loamy sand, clayey substratum, 0 to 5 percent slopes.
Lakeland loamy sand, clayey substratum, 0 to 5 percent slopes.

These soils cover 2,934 acres in this county. They are acid, low in plant nutrients, and low in organic-matter content. Because they are sandy and rapidly permeable, they hold little moisture available to plants. The soils are susceptible to wind erosion and need the protection of a plant cover. Good management consists of using a close-growing crop in the rotation, planting crops in strips crosswise to the prevailing wind, and establishing windbreaks. Organic matter can be maintained by leaving crop residues on the surface or by plowing them into the surface layer.

These soils are used for corn and soybeans and are especially well suited to truck crops, but lime and large amounts of fertilizer should be added as indicated by soil tests. Although annual crops are likely to need irrigation to offset droughtiness, trees and other deep-rooted plants generally can obtain moisture in the clayey substratum at a depth of 4 to 6 feet.

CAPABILITY UNIT IVe-3

In this unit are deep, medium-textured, well-drained soils that either are strongly sloping or are moderately sloping and severely eroded. The soils are—

Matapeake silt loam, silty substratum, 5 to 10 percent slopes, severely eroded.
Matapeake loam, 5 to 10 percent slopes, severely eroded.
Matapeake silt loam, 5 to 10 percent slopes, severely eroded.
Matapeake soils, 10 to 15 percent slopes.
Sassafras loam, 5 to 10 percent slopes, severely eroded.
Sassafras loam, 10 to 15 percent slopes, moderately eroded.

The soils in this unit occupy 1,753 acres in the county. They have stronger slopes than the soils in capability units I-4, IIe-4, and IIIe-4, and they are more susceptible to erosion. Among the practices that control erosion are stripcropping, minimum tillage, tilling on the contour, establishing buffer strips, and leaving crop residues on the surface or plowing them partly under. Terraces are needed in some places. Surface runoff, especially from the terrace channels, can be safely removed through diversions and sodded waterways, but suitable outlets must be carefully maintained.

If these soils are well managed, they produce good yields of crops commonly grown in the county, but they ought to be farmed in long rotations and be kept covered by growing plants most of the time. Where air drainage is good, the soils are especially well suited to fruit trees grown in well-sodded orchards. Soybeans are not a good crop, because they offer little or no protection against erosion.

CAPABILITY UNIT IVe-5

This unit consists of well drained and moderately well drained, moderately coarse textured and coarse textured soils that either are strongly sloping or are moderately sloping and severely eroded. The soils are—

Downer loamy sand, 5 to 10 percent slopes, severely eroded.
Downer loamy sand, 10 to 15 percent slopes.
Matapeake fine sandy loam, 5 to 10 percent slopes, severely eroded.
Sassafras sandy loam, 5 to 10 percent slopes, severely eroded.
Sassafras sandy loam, 10 to 15 percent slopes, moderately eroded.
Woodstown sandy loam, 10 to 15 percent slopes.

The soils in this unit occupy 4,006 acres in the county. In some respects these soils are similar to the soils in capability units I-5, IIe-5, and IIIe-5, and in other respects they are like the soils in units IIIe-33 and IIIe-36. They have stronger slopes than the soils in any of those units and are therefore more susceptible to erosion.

Because they are sandier, particularly in the surface layer, the soils of this unit are more easily worked than the soils of unit IVe-3. Crops are managed about the same way, though yields generally are lower on the soils in this unit, unless a good supply of plant nutrients is maintained. In areas where air drainage is adequate, orchards are especially well suited if the soils are protected by sod. Soybeans are a poor crop, even in long rotations, for they offer little or no protection against erosion.

CAPABILITY UNIT IVe-9

This unit consists of moderately well drained, medium-textured soils that have a moderately permeable or slowly permeable subsoil and are moderately limited in use because of wetness. Most of the soils are moderately sloping and severely eroded. In the unit are—

Butlertown silt loam, 5 to 10 percent slopes, severely eroded.
Mattapex loam, 5 to 10 percent slopes, severely eroded.
Mattapex silt loam, 5 to 10 percent slopes, severely eroded.
Mattapex soils, 10 to 15 percent slopes.

These soils occupy 837 acres in the county. In some respects they are similar to the soils in capability units IIe-16 and IIIe-16, but they have stronger slopes or are more severely eroded. In addition, these soils have more rapid runoff, which is accelerated by impeded drainage. Runoff should be intercepted and removed carefully.

Clean-tilled crops are only marginally suited to these soils and should be grown only in long rotations. Generally, hay and pastures are more suitable uses. Some areas can be reforested by seeding hardwoods or planting pine seedlings.

CAPABILITY UNIT IVw-6

Plummer loamy sand—the only soil in this unit—is poorly drained, coarse textured, and moderately rapidly permeable. It occupies only 90 acres in the county. This wet soil is very strongly acid, very sandy, low in organic matter content, and very low in plant nutrients. It can be drained by tiling or ditching, but tile is expensive and ditches tend to cave and flow.

Even if the soil is carefully drained, only moderate yields are obtained from crops commonly grown. Drained areas are suited to corn, soybeans, and some truck crops, though lime and large amounts of fertilizer are needed.

CAPABILITY UNIT IVs-1

In this unit are deep, coarse-textured, nearly level to moderately sloping or somewhat rolling soils that are rapidly permeable and somewhat excessively drained. They are—

Galestown loamy sand, clayey substratum, 5 to 10 percent slopes.
Galestown sand, clayey substratum, 0 to 5 percent slopes.
Lakeland loamy sand, clayey substratum, 5 to 10 percent slopes.

These soils occupy 636 acres in the county. They are sandy and droughty, are low in available moisture capacity, contain only a small amount of plant nutrients, and are susceptible to wind and water erosion. Although these soils have some characteristics similar to those of the soils in capability unit IIIs-1, they are either more sandy or more strongly sloping, and their use is more limited.

The management needed is about the same for these soils as for the soils in unit IIIs-1, but additional needs are for terraces, contour tillage, and other practices that help to control erosion. Fair to good yields of suitable crops can be obtained if the soils are well managed, are adequately fertilized, and are irrigated in dry periods. Even during extensive periods of drought, however, deep-rooted perennials can ordinarily obtain moisture from the clayey substratum underlying these soils.

CAPABILITY UNIT VIe-2

The soils in this unit are well drained and moderately well drained. Some are steep; others are strongly sloping and severely eroded. The soils are—

Downer loamy sand, 10 to 15 percent slopes, severely eroded.
Downer loamy sand, 15 to 30 percent slopes.
Keyport silty clay loam, 5 to 10 percent slopes, severely eroded.
Matapeake soils, 10 to 15 percent slopes, severely eroded.
Matapeake soils, 15 to 30 percent slopes.
Mattapex soils, 10 to 15 percent slopes, severely eroded.
Mattapex soils, 15 to 30 percent slopes.
Sassafras loam, 10 to 15 percent slopes, severely eroded.
Sassafras loam, 15 to 30 percent slopes.
Sassafras sandy loam, 10 to 15 percent slopes, severely eroded.
Sassafras sandy loam, 15 to 30 percent slopes.
Woodstown sandy loam, 15 to 30 percent slopes.

These soils have a total area of 4,501 acres in the county. They are too steep or too severely eroded for cultivated crops, but they can be used to a limited extent for hay. They can also be used for forest trees or for sodded orchards, but the most suitable common use is pasture.

Areas to be used for pasture should be prepared and then seeded or sprigged. Fertilizer is required, and lime should be applied as needed. Care must be taken to protect the areas from overgrazing, which leaves the soils nearly bare and subjects them to severe erosion (fig. 11). Drought is more likely to damage pasture on the Downer soils than on other soils in the unit.

CAPABILITY UNIT VIw-1

Only Mixed alluvial land is in this unit. It consists of variable soil material that is nearly level and mostly poorly or very poorly drained. It occupies 6,857 acres on flood plains in the county. Because this land is wet and subject to flooding, it is not suited to cultivated crops. If it is drained and well managed, however, it can be used for hay or pasture. The most common uses are as woodland and as a wildlife habitat.

CAPABILITY UNIT VIw-2

Bladen silty clay loam—the only soil in this unit—is poorly drained and slowly permeable. The surface layer is hard when dry, tough when moist, and sticky when wet, and the subsoil is so fine textured and so slowly permeable that drainage is impractical. Some areas are flooded when tides are very high. The soil has a total area of 381 acres in the county.

This soil cannot be used for cultivated crops, because it is too wet and is difficult to drain and to work. Some areas are in forest, some are idle, and some are used for grazing. Areas that are grazed can be improved by seeding, liming, fertilizing, and controlling weeds.

CAPABILITY UNIT VIIe-2

This unit consists of well drained and moderately well drained soils that either are very steep or are strongly sloping to steep and severely eroded. They are—

Keyport silty clay loam, 10 to 15 percent slopes, severely eroded.

***Figure 11.*—An area of Sassafras sandy loam, 10 to 15 percent slopes, severely eroded. The upper part of this field is nearly bare. The sandy surface layer has washed down and filled the gully in the foreground.**

Sassafras sandy loam, 15 to 30 percent slopes, severely eroded.
Sassafras sandy loam, 30 to 60 percent slopes.

These soils cover a total area of 366 acres in the county. They are too steep or too severely eroded for cultivation, but some areas can be used for special crops that are specially managed. The soils are most commonly used for grazing, but they are better used as woodland. Areas that are grazed can be improved by seeding, fertilizing and liming, and controlling weeds. Overgrazing should be prevented. In wooded areas where existing stands are not satisfactory, pine seedlings or hardwood seeds can be planted. Generally, these soils make good habitat for wildlife.

CAPABILITY UNIT VIIw-1

Only Swamp is in this unit. It consists of very wet, unclassified soil material that is not used for crops, because drainage is impractical. It occupies 275 acres in the county. Most areas of Swamp are suitable only as wetland forest or as wildlife habitat, but some areas furnish a small amount of grazing or browsing when the water is low.

CAPABILITY UNIT VIIs-1

In this unit are deep, moderately sloping to steep, coarse-textured soils that are rapidly permeable and excessively drained. Use of these soils is severely limited by droughtiness. They are—

Galestown and Lakeland loamy sands, 10 to 15 percent slopes.
Galestown and Lakeland loamy sands, 15 to 30 percent slopes.
Galestown and Lakeland sands, 5 to 10 percent slopes.

The soils in this unit have a total area of 392 acres. Because they are droughty, they are generally not suitable for crops or pasture, but some areas provide limited grazing or shelter for livestock. They also provide shelter for wildlife, particularly deer, quail, rabbits, and squirrels.

The soils generally are not well suited to trees, but Virginia pine can be grown for pulpwood if it is properly managed. Planted loblolly pine grows fairly well.

CAPABILITY UNIT VIIIw-1

This unit is made up of only one land type, Tidal marsh. It occupies 5,797 acres in the county. These soil materials are flooded regularly by high tides and are too wet and too salty for use in farming. Together with their tidal waterways, they provide excellent habitat for some kinds of wildlife, particularly ducks, geese, swans, rails, and other native and migratory waterfowl.

CAPABILITY UNIT VIIIs-2

Only Coastal beaches make up this unit. They consist of almost bare, incoherent loose sand. These areas occupy 242 acres along Chesapeake Bay and some of the larger rivers and smaller bays. They have no agricultural value but are suitable for recreation.

CAPABILITY UNIT VIIIs-4

Only Gravel and borrow pits are in this unit. They occupy 144 acres in the county and are made up of areas from which soil material has been removed. Unless these areas are completely reclaimed, they have no use in agriculture.

General Management Practices

Some management practices are applicable to all the soils used for crops in Queen Annes County. Among the practices are draining the soils that are wet all or part of the year, applying the proper soil amendments, choosing a suitable rotation, tilling the soils properly, and managing crop residues. These basic management practices are discussed in this subsection. Management for irrigated crops is explained under the heading "Irrigation Groups of Soils."

Drainage

Improved drainage is one of the principal management needs in Queen Annes County. Only a few farms are located entirely on well-drained soils. These farms are chiefly in the central and northern parts of the county and occur in areas that are higher in elevation than adjacent areas near Chesapeake Bay or the larger streams and rivers.

Artificial drainage is needed in some degree on about 55 percent of the total acreage in the county, or about 60 percent of the acreage suitable for crops. Yields are often poor or crops fail completely unless a drainage system is well established, maintained, and controlled. This is especially true in the western part of the county, in areas adjacent to the Delaware line, and in small areas elsewhere.

Of the total acreage needing drainage, more than half is occupied by moderately well drained soils. Draining these soils may consist only of removing excess surface water. The kind and degree of artificial drainage needed depend on the kinds of crops grown. Somewhat poorly drained to very poorly drained soils make up the remaining acreage that needs drainage. Before these soils can be successfully used for most crops, the improvement in drainage must be intensive.

More complete information about drainage needed for the soils in this county can be found under the heading "Drainage Groups of Soils."

The general drainage requirements of the soils are—

1. Soils that require no artificial drainage: Downer, Galestown, Lakeland, Matapeake, and Sassafras.
2. Soils that require moderate artificial drainage: Butlertown, Keyport, Klej, Mattapex, and Woodstown.
3. Soils that require intensive artificial drainage: Bertie, Bibb, Bladen, Elkton, Fallsington, Othello and Plummer.
4. Soils that require very intensive artificial drainage: Bayboro, Johnston, Pocomoke (fig. 12), and Portsmouth.

Soil amendments

The soils in this county are naturally low or very low in plant nutrients. All the soils are acid, and some are extremely acid. For these reasons, fertilizer and lime are needed to obtain high yields of most crops. The amount of lime to use and the kinds and amounts of fertilizer needed can be judged by learning how well crops have responded in the past, by determining the yield level at which the farmer is operating, and by studying the record of previous management, especially

Figure 12.—**Ponding after heavy rain on a small area of Pocomoke sandy loam in the northeastern part of the county. This area has not been drained, and there is no outlet for excess water.**

the results of chemical tests. Assistance in determining the specific requirement of each soil can be obtained from the county agricultural agent, who will arrange to have soils tested at the Soil Testing Laboratory of the University of Maryland.

Lime generally is needed about once every 3 years. On very sandy soils and on well drained or moderately well drained soils, the amount of lime needed is 1 to 1½ tons per acre. On most other soils the amount needed is 2 to 3 tons per acre, but on the Bayboro, Johnston, Pocomoke, Portsmouth, and other wet soils that have a high content of organic matter, the requirement per acre may be 3 to 5 tons or more.

Different soils in the same field may require different amounts of lime. For example, 1 ton per acre may be sufficient in areas where the soils are sandy and well drained, but in areas of dark-colored soils that are less sandy and less well drained, as much as 5 tons per acre may be needed. Using too much lime, particularly on a sandy soil, should be avoided just as carefully as using too little.

Soils that are cultivated year after year become deficient in nitrogen, phosphorus, and potassium unless these elements are replenished regularly. Unlike phosphorus and potassium, nitrogen does not come from the mineral part of the soil.

Rotations

Using a good crop rotation is an efficient way of returning organic material to the soil and of helping to control erosion. One good practice consists of growing a legume or other green-manure crop before a corn crop (fig. 13). When the green manure is plowed under, it adds nitrogen and organic matter to the soil. As a result, the corn crop that follows generally produces a higher yield and is better able to withstand dry weather.

Level or nearly level soils—those having slopes of less than 2 percent—are only slightly susceptible to water erosion and do not require rotations for erosion control. If these soils are otherwise suited to cultivated crops, they can be used continuously for either corn or soybeans. However, a cover crop grown between corn crops keeps the soil in better tilth and generally more productive.

For soils in capability class I and for most soils in capability subclasses IIw, IIIw, IVw, IIs, and IIIs, some suitable 2-year rotations are—

1. A year of corn, soybeans, or other row crop and a year of wheat, barley, or oats in which common lespedeza is seeded for hay or for seed.
2. Corn and soybeans in alternate years, with or without a cover crop or a green-manure crop after the corn, or the soybeans, or both.

Most common in the county is a 3-year rotation. Such a rotation is suitable for all the soils on which a 2-year rotation is suitable, and it can be used on soils in subclass IIe. Examples of a 3-year rotation are—

1. A row crop, a small grain, and red clover or other hay crop.
2. Row crops for 2 years, followed by a small grain in which common lespedeza is seeded. This rotation gives less protection against erosion than the first 3-year rotation listed.

For soils in subclass IIIe, a rotation lasting at least 4 years is needed. The rotation should include at least 2

Figure 13.—**Ryegrass grown as a cover crop and for green manure after corn. The grass protects the soil from rains in winter and can be turned under before the next crop is planted in spring.**

Figure 14.—In a single operation, this implement is preparing the soil, applying fertilizer, and planting corn.

years of hay or other close-growing crops. The most common 4-year rotations are—

1. A row crop, a small grain, and a hay crop for 2 years. Red clover, alfalfa, or timothy or other tall grasses are suitable plants for hay.
2. Row crops for 2 years, a small grain, and red clover or other hay crop. This rotation provides less protection than the first 4-year rotation given.

Most soils in subclass IVe and IVs need at least a 5-year rotation, if feasible, or a 4-year rotation in which the small grain is omitted. A 4-year rotation without small grain is better suited to the soils in subclass IVs than to those in subclass IVe, and a 6-year rotation is suitable for some soils in subclass IVe. Soybeans tend to make the soil more erodible and generally should not be grown on soils in subclass IVe. Some rotations commonly used on soils in subclasses IVe and IVs are—

1. A row crop, a small grain, and a hay crop for 3 years.
2. Row crops for 2 years, followed by a small grain, and then a hay crop for 2 or 3 years.
3. A row crop and 3 years of hay.

In addition to checking erosion, a good rotation helps to control weeds, insects, and some soil-borne diseases. It slows the rate at which some plant nutrients are depleted. In some places, where insecticides or fungicides have been used heavily on vegetables or other crops, growing a different kind of crop for a year or more helps to rid the soils of the residual effects of the chemicals.

Tillage

Soils must be kept in good condition if they are to produce optimum yields of crops. Tillage breaks down the structure of soils, causes loss of organic matter, and increases the hazard of erosion. The breakdown is gradual and not easily noticed until the damage is serious.

On all the soils in the county, tillage should be kept to the least amount needed for the quick germination of seeds, the adequate growth of seedlings, and the maturing of a normal crop. On the average, keeping tillage to a minimum reduces by about 40 percent the amount of soil lost through erosion during the growing season. In figure 14 a field covered with barley stubble is being prepared, fertilized, and seeded to corn, all in a single operation.

Over a period of time, many soils are compacted and made difficult to work by the heavy machinery commonly used in cultivating corn and soybeans. Such damage is most severe if the soils are too wet, and it is particularly serious on the Elkton, Othello, and other medium- to fine-textured soils that are poorly drained.

All sloping soils that are susceptible to erosion but that are suitable for cultivation (capability subclasses IIe, IIIe, and IVe) should be tilled on the contour. In addition, contour stripcropping (growing clean-cultivated crops or row crops in strips alternated with strips of close-growing, untilled crops) is needed on the soils in subclasses IIIe and IVe. A suitable rotation can be used if the crops making up the rotation are staggered on the various strips. The strips should be narrower in steeper areas than in less sloping ones. Assistance in planning and laying out crop strips can be obtained from the local office of the Soil Conservation Service.

Residue management

Leaving crop residue on the surface protects the soil from water and wind erosion (fig. 15). For example, in a field used continuously for corn, protecting the surface with residue reduces the loss of soil through washing by 10 to nearly 25 percent. Later, if the residue is turned under in such a way that it is kept on or near the surface, it increases the organic-matter content, improves soil structure, promotes aeration, reduces runoff, and increases the intake of water.

Figure 15.—Corn residue left standing to protect the soil from erosion during winter. This material will be chopped before it is turned under in spring.

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Estimated Yields

The soils of Queen Annes County vary considerably in productivity. Some soils are well suited to many kinds of crops and consistently produce fairly high yields of cultivated crops. Other soils, though suitable for cropping, produce lower yields, and still others are more suitable for pasture, woodland, or other less intensive use.

Table 5 shows the estimated average acre yields of principal crops under two levels of managememnt. In columns A are estimated average acre yields obtained under the management commonly used in the county. In columns B are estimated average acre yields under improved management.

According to reports of the U.S. Bureau of the Census for Queen Annes County, the average acre yield of corn was 56 bushels in 1959. Other average yields reported were 24 bushels of soybeans, 25 bushels of wheat, 36 bushels of barley, 10.7 tons of corn for silage, and 1.8 tons of hay.

To obtain the estimated yields shown in columns B, most of the following practices are used:

1. Contour tillage, stripcropping, terracing, minimum tillage, or similar measures are used on soils that are susceptible to erosion; the soils that need drainage are drained; excess water is disposed of safely; and irrigation is supplied to the soils that need it.
2. Rotations are of adequate length and generally consist of the following: A tilled crop to help control weeds; a deep-rooted crop to improve the permeability of the soils; legumes for one or more years to help maintain or improve fertility; and a close-growing crop or a green-manure crop. A close-growing crop or a green-manure crop helps to improve the structure and tilth of the soils, supplies organic matter, and helps to control erosion.
3. Manure and crop residues are turned under to supply nitrogen, other nutrients, and organic matter; to improve the physical characteristics of the soils; and to reduce erosion.
4. Fertilizer and lime are applied according to the needs indicated by soil tests; the county agent is consulted for information about making the tests.
5. The soils are cultivated as little as possible, but suitable methods of plowing, preparing the seedbed, and cultivating are used.
6. Planting, cultivating, and harvesting are done at the proper time and in the proper way.
7. Weeds, diseases, and insects are controlled.

More information about management practices needed to obtain good yields can be found in the subsections "Capability Groups of Soils" and "General Management Practices." Practices applied in irrigation and drainage

TABLE 5.—*Estimated average acre yields of principal crops under two levels of management*

[Yields in columns A are those obtained under management common in the county; those in columns B, under improved management. Absence of yield indicates that crop is not suited to the soil specified or is not commonly grown on it]

Map symbol	Soil	Corn		Soybeans		Barley		Rye		Tall-grass pasture	
		A	B	A	B	A	B	A	B	A	B
		Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Ba	Bayboro silt loam		90		25					65	145
BoA	Bertie and Othello silt loams, 0 to 2 percent slopes	55	105	19	36	25	47	17	32	80	145
BoB2	Bertie and Othello silt loams, 2 to 5 percent slopes, moderately eroded	55	115	20	38	25	47	18	34	80	150
Bp	Bibb silt loam	50	95	18	34	24	45	16	31	70	135
Bt	Bladen silty clay loam									80	145
BuA	Butlertown silt loam, 0 to 2 percent slopes	60	120	23	40	29	56	21	36	85	160
BuB2	Butlertown silt loam, 2 to 5 percent slopes, moderately eroded	60	125	23	40	28	55	21	36	85	170
BuC2	Butlertown silt loam, 5 to 10 percent slopes, moderately eroded	55	115	22	40	27	53	20	36	80	165
BuC3	Butlertown silt loam, 5 to 10 percent slopes, severely eroded	50	110	20	40	23	48	17	35	75	155
DoA	Downer loamy sand, 0 to 2 percent slopes	45	115	17	40	22	57	15	36	60	150
DoB	Downer loamy sand, 2 to 5 percent slopes	45	115	17	40	22	57	15	36	60	150
DoC	Downer loamy sand, 5 to 10 percent slopes	45	110	16	40	21	54	14	36	60	145
DoC3	Downer loamy sand, 5 to 10 percent slopes, severely eroded	40	100	15	38	19	48	13	34	50	135
DoD	Downer loamy sand, 10 to 15 percent slopes	40	105	15	39	20	50	13	35	55	140
DoD3	Downer loamy sand, 10 to 15 percent slopes, severely eroded									45	130
DoE	Downer loamy sand, 15 to 30 percent slopes									50	135
Ek	Elkton loam	50	95	16	25	23	40	15	27	70	125
EnA	Elkton silt loam, 0 to 2 percent slopes	50	95	16	25	23	40	15	27	70	125
EnB2	Elkton silt loam, 2 to 5 percent slopes, moderately eroded	50	105	17	27	23	40	16	29	70	130
FaA	Fallsington loam, 0 to 2 percent slopes	50	95	18	34	24	45	16	31	70	135
FaB	Fallsington loam, 2 to 5 percent slopes	55	105	20	38	26	49	18	34	75	145

See footnote at end of table.

TABLE 5.—*Estimated average acre yields of principal crops under two levels of management*—Continued

Map symbol	Soil	Corn A	Corn B	Soybeans A	Soybeans B	Barley A	Barley B	Rye A	Rye B	Tall-grass pasture A	Tall-grass pasture B
		Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
FdA	Fallsington sandy loam, 0 to 2 percent slopes	50	95	18	34	24	45	16	31	70	135
FdB	Fallsington sandy loam, 2 to 5 percent slopes	55	105	20	38	26	49	18	34	75	145
GaB	Galestown loamy sand, clayey substratum, 0 to 5 percent slopes	40	105	16	40	21	54	14	36	55	140
GaC	Galestown loamy sand, clayey substratum, 5 to 10 percent slopes	35	100	15	38	18	50	13	34	45	135
GcB	Galestown sand, clayey substratum, 0 to 5 percent slopes	35	100	15	38	18	50	13	34	45	135
GkD	Galestown and Lakeland loamy sands, 10 to 15 percent slopes									35	100
GkE	Galestown and Lakeland loamy sands, 15 to 30 percent slopes										
GlC	Galestown and Lakeland sands, 5 to 10 percent slopes									35	100
Jo	Johnston loam	50	95	18	34	24	45	16	31	70	135
KeA	Keyport loam, 0 to 2 percent slopes	55	110	20	38	26	49	18	34	75	145
KeB2	Keyport loam, 2 to 5 percent slopes, moderately eroded	55	115	20	38	25	48	18	34	75	155
KpA	Keyport silt loam, 0 to 2 percent slopes	55	110	20	38	26	49	18	34	75	145
KpB2	Keyport silt loam, 2 to 5 percent slopes, moderately eroded	55	115	20	38	25	48	18	34	75	155
KrC3	Keyport silty clay loam, 5 to 10 percent slopes, severely eroded									65	135
KrD3	Keyport silty clay loam, 10 to 15 percent slopes, severely eroded									50	115
KsA	Klej loamy sand, 0 to 2 percent slopes	35	90	14	37	19	48	13	33	55	135
KsB	Klej loamy sand, 2 to 5 percent slopes	35	95	15	39	20	51	14	35	55	140
LaB	Lakeland loamy sand, clayey substratum, 0 to 5 percent slopes	40	105	16	40	21	54	14	36	55	140
LaC	Lakeland loamy sand, clayey substratum, 5 to 10 percent slopes	35	100	15	38	18	50	13	34	45	135
MbA	Matapeake fine sandy loam, 0 to 2 percent slopes	70	135	25	40	33	62	22	36	90	170
MbB2	Matapeake fine sandy loam, 2 to 5 percent slopes, moderately eroded	65	130	24	40	31	60	22	36	85	165
MbC2	Matapeake fine sandy loam, 5 to 10 percent slopes, moderately eroded	60	120	23	40	30	58	21	36	80	160
MbC3	Matapeake fine sandy loam, 5 to 10 percent slopes, severely eroded	55	115	20	40	26	53	18	36	75	150
McA	Matapeake loam, 0 to 2 percent slopes	70	135	25	40	33	62	22	36	90	170
McB2	Matapeake loam, 2 to 5 percent slopes, moderately eroded	65	130	24	40	31	60	22	36	85	165
McC2	Matapeake loam, 5 to 10 percent slopes, moderately eroded	60	120	23	40	30	58	21	36	80	160
McC3	Matapeake loam, 5 to 10 percent slopes, severely eroded	55	115	20	40	26	53	18	36	75	150
MkA	Matapeake silt loam, 0 to 2 percent slopes	70	135	25	40	33	62	22	36	90	170
MkB2	Matapeake silt loam, 2 to 5 percent slopes, moderately eroded	65	130	24	40	31	60	22	36	85	165
MkC2	Matapeake silt loam, 5 to 10 percent slopes, moderately eroded	60	120	23	40	30	58	21	36	80	160
MkC3	Matapeake silt loam, 5 to 10 percent slopes, severely eroded	55	115	20	40	26	53	18	36	75	150
MmD	Matapeake soils, 10 to 15 percent slopes	60	120	23	40	30	58	21	36	80	160
MmD3	Matapeake soils, 10 to 15 percent slopes, severely eroded									70	145
MmE	Matapeake soils, 15 to 30 percent slopes									75	150
MoA	Matapeake silt loam, silty substratum, 0 to 2 percent slopes	75	140	26	40	35	65	24	38	90	175
MoB2	Matapeake silt loam, silty substratum, 2 to 5 percent slopes, moderately eroded	70	135	25	40	33	62	22	36	90	170
MoC2	Matapeake silt loam, silty substratum, 5 to 10 percent slopes, moderately eroded	65	130	24	40	31	60	22	36	85	165
MoC3	Matapeake silt loam, silty substratum, 5 to 10 percent slopes, severely eroded	60	120	23	40	30	58	21	36	80	160
MpA	Mattapex fine sandy loam, 0 to 2 percent slopes	60	120	23	40	29	56	21	36	85	160
MpB2	Mattapex fine sandy loam, 2 to 5 percent slopes, moderately eroded	60	125	23	40	28	55	21	36	85	170

See footnote at end of table.

TABLE 5.—*Estimated average acre yields of principal crops under two levels of management*—Continued

Map symbol	Soil	Corn		Soybeans		Barley		Rye		Tall-grass pasture	
		A	B	A	B	A	B	A	B	A	B
		Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
MsA	Mattapex loam, 0 to 2 percent slopes	60	120	23	40	29	56	21	36	85	160
MsB2	Mattapex loam, 2 to 5 percent slopes, moderately eroded	60	125	23	40	28	55	21	36	85	170
MsC2	Mattapex loam, 5 to 10 percent slopes, moderately eroded	55	115	22	40	27	53	20	36	80	165
MsC3	Mattapex loam, 5 to 10 percent slopes, severely eroded	50	110	20	40	23	48	17	35	75	155
MtA	Mattapex silt loam, 0 to 2 percent slopes	60	120	23	40	29	56	21	36	85	160
MtB2	Mattapex silt loam, 2 to 5 percent slopes, moderately eroded	60	125	23	40	28	55	21	36	85	170
MtC2	Mattapex silt loam, 5 to 10 percent slopes, moderately eroded	55	115	22	40	27	53	20	36	80	165
MtC3	Mattapex silt loam, 5 to 10 percent slopes, severely eroded	50	110	20	40	23	48	17	35	75	155
MxD	Mattapex soils, 10 to 15 percent slopes	55	115	21	40	25	50	18	36	75	160
MxD3	Mattapex soils, 10 to 15 percent slopes, severely eroded	------	------	------	------	------	------	------	------	65	145
MxE	Mattapex soils, 15 to 30 percent slopes	------	------	------	------	------	------	------	------	70	150
ObA	Othello silt loam, 0 to 2 percent slopes	55	105	19	36	25	47	17	32	80	145
ObB2	Othello silt loam, 2 to 5 percent slopes, moderately eroded	55	115	20	38	25	47	18	34	80	150
OeC2	Othello and Elkton soils, 5 to 10 percent slopes, moderately eroded	55	110	19	37	25	47	17	33	80	145
Pd	Plummer loamy sand	------	50	------	22	------	------	------	------	------	85
Pk	Pocomoke loam	50	95	18	34	24	45	16	31	70	135
Pm	Pocomoke sandy loam	50	95	18	34	24	45	16	31	70	135
Po	Portsmouth silt loam	55	105	19	36	25	47	17	32	80	145
SaA	Sassafras loam, 0 to 2 percent slopes	65	130	25	40	33	62	22	36	85	165
SaB2	Sassafras loam, 2 to 5 percent slopes, moderately eroded	60	125	24	40	31	60	21	36	80	160
SaC2	Sassafras loam, 5 to 10 percent slopes, moderately eroded	60	120	23	40	29	57	20	36	80	155
SaC3	Sassafras loam, 5 to 10 percent slopes, severely eroded	55	115	21	38	27	51	18	34	75	145
SaD2	Sassafras loam, 10 to 15 percent slopes, moderately eroded	60	115	22	39	29	55	20	36	80	150
SaD3	Sassafras loam, 10 to 15 percent slopes, severely eroded	------	------	------	------	------	------	------	------	70	135
SaE	Sassafras loam, 15 to 30 percent slopes	------	------	------	------	------	------	------	------	75	140
SfA	Sassafras sandy loam, 0 to 2 percent slopes	65	125	24	40	32	60	22	36	85	160
SfB2	Sassafras sandy loam, 2 to 5 percent slopes, moderately eroded	60	120	23	40	30	58	21	36	80	155
SfC2	Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded	60	115	22	40	28	55	20	36	80	150
SfC3	Sassafras sandy loam, 5 to 10 percent slopes, severely eroded	55	110	20	38	26	49	18	34	75	140
SfD2	Sassafras sandy loam, 10 to 15 percent slopes, moderately eroded	60	110	21	39	27	51	19	35	80	145
SfD3	Sassafras sandy loam, 10 to 15 percent slopes, severely eroded	------	------	------	------	------	------	------	------	70	130
SfE	Sassafras sandy loam, 15 to 30 percent slopes	------	------	------	------	------	------	------	------	75	135
SfE3	Sassafras sandy loam, 15 to 30 percent slopes, severely eroded	------	------	------	------	------	------	------	------	65	120
SfF	Sassafras sandy loam, 30 to 60 percent slopes	------	------	------	------	------	------	------	------	65	125
WdA	Woodstown loam, 0 to 2 percent slopes	55	110	22	40	29	54	20	36	80	150
WdB2	Woodstown loam, 2 to 5 percent slopes, moderately eroded	60	115	23	40	30	57	21	36	85	160
WoA	Woodstown sandy loam, 0 to 2 percent slopes	55	110	22	40	29	54	20	36	80	150
WoB2	Woodstown sandy loam, 2 to 5 percent slopes, moderately eroded	60	115	23	40	30	57	21	36	85	160
WoC2	Woodstown sandy loam, 5 to 10 percent slopes, moderately eroded	55	105	21	40	29	54	20	36	80	155
WoD	Woodstown sandy loam, 10 to 15 percent slopes	55	105	20	40	27	51	18	36	75	150
WoE	Woodstown sandy loam, 15 to 30 percent slopes	------	------	------	------	------	------	------	------	70	140

[1] The number of days 1 acre will support one cow, horse, or steer without injury to the pasture.

of soils are described in the subsection "Engineering Uses of Soils."

The yields shown in columns B are not presumed to be the highest obtainable, but they set a goal that is practical for most farmers to reach if they use good management. Yields on the same soil can be expected to vary from year to year because of differences in the weather, in kind of management, in the varieties of crops grown, and in numbers and kinds of diseases and insects.

Woodland [3]

Woodland occupies about 22 percent of Queen Annes County, or 53,360 acres. The stands consist mainly of hardwoods and pines, including four of the most valuable species in the State—white oak, yellow-poplar, sweetgum, and loblolly pine. Trees harvested from wooded areas are used for lumber and timber, poles and piling, barrel staves, veneer for furniture and baskets, and pulpwood. Some owners cut fenceposts and fuelwood for domestic use.

Oaks, sweetgum, yellow-poplar, and other hardwoods cover three-fourths of the wooded acreage and occur on uplands and bottom lands throughout Queen Annes County. Loblolly pine grows in the lower areas in the southern and western parts of the county. Virginia pine and shortleaf pine occur in heavily cutover stands and in areas of better drained sandy soils that have been farmed and then abandoned.

Most woodland in the county has been cut over. Generally, the stands are not fully stocked, and they do not contain the best species. Because of overcutting and little or no management, wooded areas are covered mainly with less desirable trees. Woodland should be managed so that valuable oaks, yellow-poplar, sweetgum, and loblolly pine grow in stands that are well stocked and are best suited to each soil.

Because of its value for both timber and pulpwood, loblolly pine is the most economically valuable tree in the county. Here, the species is about at the northern limit of its natural range, but it grows rapidly on most soils, reseeds naturally where conditions permit, and can be readily established in pure stands by planting seedlings. At least 95 percent of the county is suitable for the commercial production of loblolly pine, and about 40 percent of the total acreage is excellent for this use.

Woodland suitability groups

Just as soils are placed in capability units according to their suitability for crops and pasture, they can be grouped according to their suitability for trees. Each woodland suitability group is made up of soils that are suitable for the same kinds of trees, require similar management, and have about the same potential productivity.

The potential productivity of a soil for trees is expressed as the site index, which is the height, in feet, that a specified kind of tree, growing on that soil, will reach in 50 years. For the soils of Queen Annes County, site indexes have been determined only for loblolly pine—the most important species grown commercially in the area. The site indexes given in this report are based partly on studies made in Queen Annes County and partly on studies in other counties on the Eastern Shore, in Southern Maryland, and in Delaware. In addition, they were correlated with site indexes based on similar studies in Virginia.

All the soils in one woodland suitability group have about the same site index and are suitable for the same kinds of trees. Also, they are similar with respect to the hazards and limitations that affect management: seedling mortality, plant competition, equipment limitation, erosion hazard, and windthrow hazard.

Listed in table 6, and later described in the text, are the woodland suitability groups in Queen Annes County. In this table the woodland group numbers are not consecutive, because they are part of a system of grouping all the soils of Maryland and Delaware, and only a comparatively few of all the woodland groups in the two States are represented in this county.

For the soils in each woodland group, table 6 gives the range in site index for loblolly pine; it lists species suitable for planting, in order of relative suitability; and it rates as slight, moderate, or severe the hazards and limitations affecting management.

Seedling mortality refers to the mortality of naturally occurring or planted tree seedlings as influenced by the kind of soil. Competition from other plants is the invasion or growth of undesirable species when openings are made in the canopy.

Limitations on the use of equipment vary according to slope and characteristics of the soils that restrict or prohibit the use of equipment commonly used in tending and harvesting trees.

The hazard of erosion is rated according to susceptibility of the soils to washing or blowing unless measures are used to control unnecessary soil erosion or to minimize soil deterioration. The rating for hazard of windthrow is based on soil characterisitcs that control the development of tree roots.

Table 7 gives growth and yield information for fully stocked, unmanaged stands of second-growth loblolly pine.

WOODLAND SUITABILITY GROUP 1

This group (see table 6) consists of poorly drained and very poorly drained soils on uplands. They have a surface layer of loam, silt loam, or sandy loam and a subsoil ranging from friable sandy clay loam to plastic clay. Some of the soils occur in upland depressions and may be ponded in wet periods unless surface drainage is improved. The soils in the group are—

Ba	Bayboro silt loam.
Ek	Elkton loam.
EnA	Elkton silt loam, 0 to 2 percent slopes.
EnB2	Elkton silt loam, 2 to 5 percent slopes, moderately eroded.
FaA	Fallsington loam, 0 to 2 percent slopes.
FaB	Fallsington loam, 2 to 5 percent slopes.
FdA	Fallsington sandy loam, 0 to 2 percent slopes.
FdB	Fallsington sandy loam, 2 to 5 percent slopes.
Pk	Pocomoke loam.
Pm	Pocomoke sandy loam.
Po	Portsmouth silt loam.

The soils in this group occupy 59,943 acres, or 25.1 percent of the county.

[3] A. R. Bond, assistant State forester, Maryland Department of Forests and Parks, helped to prepare this subsection.

TABLE 6.—*Woodland suitability groups and ratings*

[Dashed lines indicate that soils in group are not suited to kind of

Woodland group and map symbols	Site index range for loblolly pine	Suitable species in order of priority	
		For timber	For Christmas trees
Group 1 Ba, Ek, EnA, EnB2, FaA, FaB, FdA, FdB, Pk, Pm, Po.	85–94+	Loblolly pine, sweetgum, mixed oaks, yellow-poplar.	Scotch pine, white pine, Austrian pine.
Group 2 Bp, Jo, My.	85–94+	Mixed oaks, sweetgum, yellow-poplar, loblolly pine.	Scotch pine, white pine.
Group 3 BoA, BoB2, KsA, KsB, WdA, WdB2, WoA, WoB2.	85–94+	Loblolly pine, yellow-poplar, sweetgum, mixed oaks, Virginia pine.	Scotch pine, Norway spruce, Austrian pine, white pine.
Group 5 GaB, GaC, GcB, GkD, GlC, LaB, LaC.	75–84	Loblolly pine, shortleaf pine, Virginia pine.	Scotch pine, white pine, Virginia pine.
Group 6 GkE.	75–84	Loblolly pine, shortleaf pine, Virginia pine.	Scotch pine, white pine, Virginia pine.
Group 7 DoA, DoB, MbA, MbB2, McA, McB2, MkA, MkB2, MoA, MoB2, SaA, SaB2, SfA, SfB2.	75–84	Loblolly pine, shortleaf pine, Virginia pine, mixed oaks.	Scotch pine, Norway spruce, Austrian pine, white pine.
Group 8 DoC, DoD, MbC2, McC2, MkC2, MmD, MoC2, SaC2, SaD2, SfC2, SfD2.	75–84	Loblolly pine, shortleaf pine, Virginia pine, mixed oaks.	Scotch pine, Norway spruce, Austrian pine, white pine.
Group 9 BuC2, DoE, MmE, MsC2, MtC2, MxD, MxE, SaE, SfE, SfF, WoC2, WoD, WoE.	75–84	Loblolly pine, mixed oaks, shortleaf pine, Virginia pine.	Scotch pine, Norway spruce, Austrian pine.
Group 10 Bt, ObA, ObB2, OeC2, Pd.	75–84	Mixed oaks, sweetgum, loblolly pine.	Scotch pine, white pine, Austrian pine.
Group 11 BuA, BuB2, KeA, KeB2, KpA, KpB2, MpA, MpB2, MsA, MsB2, MtA, MtB2.	75–84	Loblolly pine, mixed oaks, sweetgum.	Scotch pine, Norway spruce, Austrian pine.
Group 13 DoC3, DoD3, MbC3, McC3, MkC3, MmD3, MoC3, SaC3, SaD3, SfC3, SfD3, SfE3.	65–74	Loblolly pine, shortleaf pine, Virginia pine.	Scotch pine, Norway spruce, Austrian pine, white pine.
Group 17 BuC3, KrC3, KrD3, MsC3, MtC3, MxD3.	55–64	Loblolly pine, Virginia pine	Scotch pine, Virginia pine
Group 20 Cb.	<50	Virginia pine, loblolly pine	----------
Group 21 Gr, Ma, Sw, Tm.	----------	----------	----------

for major limitations and hazards affecting management

tree specified or that hazards and limitations have not been rated]

Seedling mortality	Competition from other plants for— Conifers	Competition from other plants for— Hardwoods	Limitations on use of equipment	Hazard of erosion	Hazard of windthrow
Slight	Severe	Moderate	Severe because of wetness	Slight	Slight.
Moderate because of flooding	Severe	Moderate	Severe because of wetness and flooding.	Slight	Slight.
Slight	Severe	Moderate	Moderate because of wetness	Slight	Slight.
Moderate because of droughtiness	Slight	Slight	Moderate because of looseness	Slight	Slight.
Moderate because of droughtiness	Moderate	Slight	Severe because of slope and looseness	Moderate	Slight.
Slight	Moderate	Slight	Slight	Slight	Slight.
Slight	Moderate	Slight	Slight	Moderate	Slight.
Slight	Moderate	Slight	Moderate or severe because of slope	Moderate or severe.	Moderate.
Slight	Moderate	Severe	Severe because of wetness	Slight	Slight.
Slight	Severe	Moderate	Moderate because of wetness	Slight	Moderate.
Moderate because of droughtiness and poor seedbeds.	Slight	Slight	Moderate or severe because of slopes	Severe	Moderate.
Severe because of poor seedbeds	Slight	Slight	Moderate because of slope and seasonal wetness.	Severe	Severe.
Severe because of droughtiness, salt water, and windblown sand.	Slight	Slight	Severe because of looseness	Severe	Slight.

TABLE 7.—*Growth and yield information, per acre, for fully stocked, unmanaged stands of second-growth loblolly pine*

Site index	Age	Total merchantable volume		Average diameter at breast height
		Cords	Board feet (Doyle rule)	
	Years			*Inches*
70	20	17	----------	5. 4
	30	31	1, 000	7. 8
	40	42	3, 500	9. 6
	50	50	6, 500	10. 9
	60	55	10, 000	12. 1
	70	59	12, 500	13. 0
	80	62	15, 000	13. 8
80	20	22	----------	6. 2
	30	38	2, 000	8. 7
	40	51	6, 000	10. 7
	50	60	11, 500	12. 2
	60	66	16, 000	13. 6
	70	70	19, 500	14. 6
	80	73	22, 000	15. 5
90	20	27	----------	6. 9
	30	46	4, 000	9. 6
	40	61	10, 000	11. 7
	50	71	16, 500	13. 6
	60	78	22, 000	15. 0
	70	82	26, 000	16. 2
	80	85	29, 000	17. 2
100	20	32	500	7. 4
	30	53	6, 000	10. 4
	40	71	14, 500	12. 8
	50	84	23, 000	14. 7
	60	92	29, 500	16. 2
	70	96	33, 000	17. 6
	80	100	35, 500	18. 6

Although loblolly pine is the best tree for producing timber on these soils, stands of sweetgum and of commercially valuable oaks should be well managed until they are ready for harvesting (fig. 16). Then, the hardwoods can be replaced by loblolly pine. Yellow-poplar should be encouraged in areas where surface drainage is adequate.

***Figure 16.*—Clear cutting a stand of oak and gum on Elkton silt loam, 0 to 2 percent slopes. After this area is cleared, it will be planted to loblolly pine.**

At site index 85, the expected yield per acre from well-stocked, unmanaged stands of 50-year-old loblolly pine is about 14,000 board feet of merchantable timber or about 65 cords of pulpwood. For the next 10 to 20 years, the expected yearly increase in yield, per acre, is about 500 board feet of timber or about one-half cord of pulpwood.

WOODLAND SUITABILITY GROUP 2

This group (see table 6) consists of poorly drained and very poorly drained soils on flood plains. These soils may be flooded one or more times a year, and they are subject to scouring or deposition, but floodwater seldom stands for long periods and does not stagnate. The soils are—

Bp	Bibb silt loam.
Jo	Johnston loam.
My	Mixed alluvial land.

The soils in this group have a total area of 10,615 acres, or 4.5 percent of the county.

These soils are well suited to hardwoods, which tend to eliminate pine. Sweetgum and commercially valuable oaks are preferred over loblolly pine. Yellow-poplar should be encouraged on hummocks, on natural levees along streams, and in other areas where surface drainage is good.

At site index 85, the expected yield per acre from well-stocked, unmanaged stands of loblolly pine 50 years old is about 14,000 board feet of merchantable timber or about 65 cords of pulpwood. For the next 10 to 20 years, the expected annual increase in yield, per acre, is about 500 board feet of timber or about one-half cord of pulpwood.

WOODLAND SUITABILITY GROUP 3

This group (see table 6) is made up of moderately well drained or somewhat poorly drained soils that have a subsoil ranging from loose sand or loamy sand to firm sandy clay loam or clay loam. Permeability in the subsoil is moderately slow to rapid. The soils are—

BoA	Bertie and Othello silt loams, 0 to 2 percent slopes.
BoB2	Bertie and Othello silt loams, 2 to 5 percent slopes, moderately eroded.
KsA	Klej loamy sand, 0 to 2 percent slopes.
KsB	Klej loamy sand, 2 to 5 percent slopes.
WdA	Woodstown loam, 0 to 2 percent slopes.
WdB2	Woodstown loam, 2 to 5 percent slopes, moderately eroded.
WoA	Woodstown sandy loam, 0 to 2 percent slopes.
WoB2	Woodstown sandy loam, 2 to 5 percent slopes, moderately eroded.

The soils in this group occupy 23,762 acres, or about 10 percent of the county.

Loblolly pine is of first priority on these soils. Yellow-poplar, sweetgum, and valuable oaks growing on the areas should be well managed and then placed by loblolly pine after the mature trees are harvested.

Limitations on the use of equipment are moderate because the surface layer is wet and the water table is high in winter and early in spring.

At site index 85, the expected yield per acre from well-stocked, unmanaged stands of loblolly pine 50 years old

is about 14,000 board feet of merchantable timber or about 65 cords of pulpwood. For the next 10 to 20 years, the expected yearly increase in yield, per acre, is about 500 board feet of timber or about one-half cord of pulpwood.

WOODLAND SUITABILITY GROUP 5

This group (see table 6) consists of deep, nearly level to strongly sloping sands and loamy sands that are somewhat excessively or excessively drained. These soils are rapidly permeable throughout, but some of them have a moisture-retaining clayey layer at a depth of 4 to 6 feet. The soils in the group are—

- GaB Galestown loamy sand, clayey substratum, 0 to 5 percent slopes.
- GaC Galestown loamy sand, clayey substratum, 5 to 10 percent slopes.
- GcB Galestown sand, clayey substratum, 0 to 5 percent slopes.
- GkD Galestown and Lakeland loamy sands, 10 to 15 percent slopes.
- GlC Galestown and Lakeland sands, 5 to 10 percent slopes.
- LaB Lakeland loamy sand, clayey substratum, 0 to 5 percent slopes.
- LaC Lakeland loamy sand, clayey substratum, 5 to 10 percent slopes.

These soils occupy 3,856 acres, or 1.6 percent of the county.

The soils in this group are not well suited to most hardwoods. Although loblolly pine is the favored species, stands of shortleaf or Virginia pine should be managed until they are ready for harvesting. Then, they can be replaced by loblolly pine.

The use of heavy equipment is moderately limited by the loose, sandy surface layer and, in some places, by slope. The hazard of erosion generally is only slight, but unprotected areas planted to pine seedlings are subject to wind erosion until the pines are established and volunteer plants cover the soil.

At site index 80, the expected yield per acre from well-stocked, unmanaged stands of 50-year-old loblolly pine is about 11,500 board feet of merchantable timber or about 60 cords of pulpwood. For the next 10 to 20 years, the expected annual increase in yield, per acre, is about 400 board feet of timber or about one-half cord of pulpwood.

WOODLAND SUITABILITY GROUP 6

The only soils in this group (see table 6) are Galestown and Lakeland loamy sands, 15 to 30 percent slopes (GkE). Except for their steeper slopes, these soils are similar to those in woodland suitability group 5. They have a total area of only 106 acres, or less than 0.1 percent of the county.

Loblolly pine is the favored species on these soils, but areas of shortleaf and Virginia pines should be well managed until the trees reach marketable age. Then, they can be replaced by loblolly pine.

At site index 80, a well-stocked, unmanaged stand of 50-year-old loblolly pine can be expected to yield, per acre, about 11,500 board feet of merchantable timber or about 60 cords of pulpwood. For the next 10 to 20 years, the expected yearly increase, per acre, is about 400 board feet of timber or about one-half cord of pulpwood.

WOODLAND SUITABILITY GROUP 7

This group (see table 6) consists of deep, well-drained, nearly level or gently sloping soils that have a subsoil of friable or firm sandy clay loam or silty clay loam. Some areas are moderately eroded. The soils are—

- DoA Downer loamy sand, 0 to 2 percent slopes.
- DoB Downer loamy sand, 2 to 5 percent slopes.
- MbA Matapeake fine sandy loam, 0 to 2 percent slopes.
- MbB2 Matapeake fine sandy loam, 2 to 5 percent slopes, moderately eroded.
- McA Matapeake loam, 0 to 2 percent slopes.
- McB2 Matapeake loam, 2 to 5 percent slopes, moderately eroded.
- MkA Matapeake silt loam, 0 to 2 percent slopes.
- MkB2 Matapeake silt loam, 2 to 5 percent slopes, moderately eroded.
- MoA Matapeake silt loam, silty substratum, 0 to 2 percent slopes.
- MoB2 Matapeake silt loam, silty substratum, 2 to 5 percent slopes, moderately eroded.
- SaA Sassafras loam, 0 to 2 percent slopes.
- SaB2 Sassafras loam, 2 to 5 percent slopes, moderately eroded.
- SfA Sassafras sandy loam, 0 to 2 percent slopes.
- SfB2 Sassafras sandy loam, 2 to 5 percent slopes, moderately eroded.

This is the most extensive woodland suitability group in the county. The soils occupy 69,147 acres, or 29.0 percent of the total area.

Loblolly pine is the favored species, though upland hardwoods grow well on these soils, especially the more silty ones. Good stands of yellow-poplar, desirable oaks, and other hardwoods suitable for timber should be managed and then replaced by loblolly pine after the mature trees are harvested.

At site index 80, the expected yield per acre from well-stocked, unmanaged stands of loblolly pine 50 years old is about 11,500 board feet of merchantable timber or about 60 cords of pulpwood. For the next 10 to 20 years, the expected annual increase in yield, per acre, is about 400 board feet of timber or about one-half cord of pulpwood.

WOODLAND SUITABILITY GROUP 8

The soils in this group (see table 6) are steeper than those in woodland suitability group 7, for slopes range from 5 to 15 percent. The soils are—

- DoC Downer loamy sand, 5 to 10 percent slopes.
- DoD Downer loamy sand, 10 to 15 percent slopes.
- MbC2 Matapeake fine sandy loam, 5 to 10 percent slopes, moderately eroded.
- McC2 Matapeake loam, 5 to 10 percent slopes, moderately eroded.
- MkC2 Matapeake silt loam, 5 to 10 percent slopes, moderately eroded.
- MmD Matapeake soils, 10 to 15 percent slopes.
- MoC2 Matapeake silt loam, silty substratum, 5 to 10 percent slopes, moderately eroded.
- SaC2 Sassafras loam, 5 to 10 percent slopes, moderately eroded.
- SaD2 Sassafras loam, 10 to 15 percent slopes, moderately eroded.
- SfC2 Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded.
- SfD2 Sassafras sandy loam, 10 to 15 percent slopes, moderately eroded.

These soils have a total area of 10,333 acres, or 4.2 percent of the county. About half of the total acreage is now wooded.

Species suitable for this group are the same as those for group 7.

These soils are most likely to erode in areas that are heavily cut over, are being prepared for planting, or are newly planted to seedlings.

The expected yield, per acre, of timber or pulpwood is about the same as for the soils in group 7.

WOODLAND SUITABILITY GROUP 9

Some soils in this group are moderately sloping to steep and moderately well drained, and others are steep or very steep and well drained (see table 6). Some areas are moderately eroded. The soils in the group are—

BuC2 Butlertown silt loam, 5 to 10 percent slopes, moderately eroded.
DoE Downer loamy sand, 15 to 30 percent slopes.
MmE Matapeake soils, 15 to 30 percent slopes.
MsC2 Mattapex loam, 5 to 10 percent slopes, moderately eroded.
MtC2 Mattapex silt loam, 5 to 10 percent slopes, moderately eroded.
MxD Mattapex soils, 10 to 15 percent slopes.
MxE Mattapex soils, 15 to 30 percent slopes.
SaE Sassafras loam, 15 to 30 percent slopes.
SfE Sassafras sandy loam, 15 to 30 percent slopes.
SfF Sassafras sandy loam, 30 to 60 percent slopes.
WoC2 Woodstown sandy loam, 5 to 10 percent slopes, moderately eroded.
WoD Woodstown sandy loam, 10 to 15 percent slopes.
WoE Woodstown sandy loam, 15 to 30 percent slopes.

These soils occupy 4,918 acres, or 2.1 percent of the county. Because they have severe limitations that restrict their use for crops, they are important soils for woodland. Most of the acreage is wooded.

Loblolly pine should have first priority, but any good stand of hardwoods should be managed for timber.

Limitations on the use of equipment are moderate on slopes of 15 percent or less and are severe on slopes of more than 15 percent. The erosion hazard is moderate on the Woodstown soils and severe on the other soils in the group. The hazard of windthrow is greatest on the Butlertown, Mattapex, and Woodstown soils.

At site index 80, the expected yield per acre from well-stocked, unmanaged stands of loblolly pine 50 years old is about 11,500 board feet of merchantable timber or about 60 cords of pulpwood. For the next 10 to 20 years, the expected annual increase in yield, per acre, is about 400 board feet of timber or about one-half cord of pulpwood.

WOODLAND SUITABILITY GROUP 10

This group (see table 6) consists of poorly drained soils that have a sandy to clayey surface layer and subsoil. Where these soils occur in depressions that have no outlet, they may be temporarily ponded in wet periods. The soils are—

Bt Bladen silty clay loam.
ObA Othello silt loam, 0 to 2 percent slopes.
ObB2 Othello silt loam, 2 to 5 percent slopes, moderately eroded.
OeC2 Othello and Elkton soils, 5 to 10 percent slopes, moderately eroded.
Pd Plummer loamy sand.

These soils have a total area of 10,299 acres, or 4.3 percent of the county.

Loblolly pine is the favored species, but sweetgum and some water-tolerant oaks produce merchantable products on these soils, and yellow-poplar should be encouraged in areas where surface drainage is adequate.

At site index 80, the expected yield per acre from well-stocked, unmanaged stands of 50-year-old loblolly pine is about 11,500 board feet of merchantable timber or about 60 cords of pulpwood. For the next 10 to 20 years, the expected yearly increase in yield, per acre, is about 400 board feet of timber or about one-half cord of pulpwood.

WOODLAND SUITABILITY GROUP 11

This group (see table 6) consists of level or gently sloping, moderately well drained soils that have a subsoil of heavy clay or of platy heavy silt loam or silty clay loam. These soils are seasonally wet, commonly in winter and early in spring. They are—

BuA Butlertown silt loam, 0 to 2 percent slopes.
BuB2 Butlertown silt loam, 2 to 5 percent slopes, moderately eroded.
KeA Keyport loam, 0 to 2 percent slopes.
KeB2 Keyport loam, 2 to 5 percent slopes, moderately eroded.
KpA Keyport silt loam, 0 to 2 percent slopes.
KpB2 Keyport silt loam, 2 to 5 percent slopes, moderately eroded.
MpA Mattapex fine sandy loam, 0 to 2 percent slopes.
MpB2 Mattapex fine sandy loam, 2 to 5 percent slopes, moderately eroded.
MsA Mattapex loam, 0 to 2 percent slopes.
MsB2 Mattapex loam, 2 to 5 percent slopes, moderately eroded.
MtA Mattapex silt loam, 0 to 2 percent slopes.
MtB2 Mattapex silt loam, 2 to 5 percent slopes, moderately eroded.

These soils occupy 33,431 acres, or 14.0 percent of the county.

Hardwoods should have first priority on the soils of this group, for yellow-poplar, sweetgum, and many kinds of oaks grow well. However, loblolly pine commonly invades abandoned or idle areas, and it is suitable for planting if undesirable hardwoods, shrubs, and vines are controlled until the pine seedlings are well established.

The hazard of windthrow is moderate because trees on these soils generally have shallow roots.

Yields from loblolly pine are about the same as for woodland suitability group 10.

WOODLAND SUITABILITY GROUP 13

This group (see table 6) consists of well-drained, severely eroded soils that have a friable or firm sandy clay loam or silty clay loam subsoil. They are—

DoC3 Downer loamy sand, 5 to 10 percent slopes, severely eroded.
DoD3 Downer loamy sand, 10 to 15 percent slopes, severely eroded.
MbC3 Matapeake fine sandy loam, 5 to 10 percent slopes, severely eroded.
McC3 Matapeake loam, 5 to 10 percent slopes, severely eroded.
MkC3 Matapeake silt loam, 5 to 10 percent slopes, severely eroded.
MmD3 Matapeake soils, 10 to 15 percent slopes, severely eroded.
MoC3 Matapeake silt loam, silty substratum, 5 to 10 percent slopes, severely eroded.
SaC3 Sassafras loam, 5 to 10 percent slopes, severely eroded.
SaD3 Sassafras loam, 10 to 15 percent slopes, severely eroded.
SfC3 Sassafras sandy loam, 5 to 10 percent slopes, severely eroded.
SfD3 Sassafras sandy loam, 10 to 15 percent slopes, severely eroded.
SfE3 Sassafras sandy loam, 15 to 30 percent slopes, severely eroded.

The soils in this group should be important for woodland in Queen Annes County, though their total acreage is fairly small. They occupy 4,915 acres, or 2.1 percent of the county.

Loblolly pine is of first priority on these soils because of its economic value, and it can be established by planting seedlings. If hardwoods are desired, they should be established by direct seeding.

The use of equipment is moderately limited on slopes of not more than 15 percent, but equipment limitations are severe on slopes exceeding 15 percent. Windthrow is a moderate hazard because the soils have a shallow root zone as a result of severe erosion.

At site index 70, a well-stocked, unmanaged stand of 50-year-old loblolly pine can be expected to yield, per acre, about 6,500 board feet of merchantable timber or about 50 cords of pulpwood. For the next 10 to 20 years, the expected annual increase in yield, per acre, is about 300 board feet of timber or about four-tenths cord of pulpwood.

WOODLAND SUITABILITY GROUP 17

This group (see table 6) consists of severely eroded, moderately or strongly sloping, moderately well drained soils. They are—

BuC3 Butlertown silt loam, 5 to 10 percent slopes, severely eroded.
KrC3 Keyport silty clay loam, 5 to 10 percent slopes, severely eroded.
KrD3 Keyport silty clay loam, 10 to 15 percent slopes, severely eroded.
MsC3 Mattapex loam, 5 to 10 percent slopes, severely eroded.
MtC3 Mattapex silt loam, 5 to 10 percent slopes, severely eroded.
MxD3 Mattapex soils, 10 to 15 percent slopes, severely eroded.

The soils of this group occupy only 857 acres, or 0.4 percent of the county.

Loblolly pine is the preferred species because its economic value is higher than that of other trees.

Windthrow is a severe hazard on these eroded soils because little soil remains for rooting above the lower subsoil, which impedes root penetration.

Trees grow more slowly and yields are considerably lower on these soils than on most other soils in the county. At site index 60, the expected yield per acre from well-stocked, unmanaged stands of loblolly pine 50 years old is only about 1,500 to 2,000 board feet of merchantable timber, but the yield of pulpwood should be about 40 cords. For the next 10 to 20 years, the expected yearly increase in yield, per acre, is about 250 board feet of timber or about four-tenths of a cord of pulpwood.

WOODLAND SUITABILITY GROUP 20

Only one land type—Coastal beaches (Cb)—is in this group (see table 6). The areas consist of loose, extremely droughtly sand that is not suitable for agriculture. In most places there are no trees, but pines have invaded some areas.

Coastal beaches occupy only 242 acres, or about 0.1 percent of the county. On these beaches the growth of trees is so poor that woodland products cannot be produced economically, though fairly good stands of loblolly or Virginia pine occur in some places. Even though trees grow slowly, bare areas are best planted to loblolly pine.

Seedling mortality is severe because at times the young trees are cut by windblown sand, are fully exposed to the hot sun and beating rain, and are washed or covered by salt water. Limitations to the use of equipment are severe, for traction is poor and sand damages moving parts of machinery. Wind erosion is a severe hazard. Tree seedlings may be blown out if their roots are exposed by shifting sand. The hazard of windthrow is only slight except during storms of hurricane intensity.

WOODLAND SUITABILITY GROUP 21

This group (see table 6) consists of miscellaneous land types that are not suited to trees or are too wet for woodland management. They are—

Gr Gravel and borrow pits.
Ma Made land.
Sw Swamp.
Tm Tidal marsh.

These land types have a total area of 6,296 acres, or 2.6 percent of the county. They have not been rated for loblolly pine or other species of trees.

Gravel and borrow pits are areas from which the soil and generally much of the underlying material have been removed. In most places they are not suited to trees unless they are completely reclaimed. Made land consists of areas that have been filled artificially with earth or reworked by man; these areas generally are used for building sites. Swamp consists of extremely wet areas having many plants, including trees, that tolerate water. Some natural timber may be produced on areas of Swamp, but the land is too wet for woodland management to be worthwhile. The areas of Tidal marsh are unsuitable for trees. The most important uses of Swamp and Tidal marsh are as shelters for wildlife and feeding areas for waterfowl.

Wildlife

Wildlife is abundant in Queen Annes County and is of three major kinds: birds and mammals that frequent open land; those that frequent woodland; and those that frequent wetland.

As habitats for these major kinds of wildlife, the soils of the county generally are highly suitable. More than 90 percent of the land area is potentially well suited to open-land wildlife and to woodland wildlife. Open-land wildlife includes rabbit, quail, other upland game birds, and to some extent deer. Examples of woodland wildlife are deer, squirrel, turkey, and woodcock. More than 30 percent of the land area is potentially well suited to raccoon, muskrat, rail, duck, geese, and other forms of wetland wildlife. Canada geese (fig. 17) and other migratory waterfowl make up an important part of the wetland wildlife in this county.

In addition to its land area, the county has about 274 miles of shoreline along rivers and bays that are important to wildlife (*6*). These shores consist of areas between normal high tide and normal low tide. Although they can neither be indicated clearly on a map nor measured accurately, they are important as feeding grounds for some kinds of waterfowl and other birds and for some mammals, especially raccoons. Dead fish, crabs, and shellfish are scavenged in these areas, and live ones are hunted. Any kind of pollution by insecticides and herbi-

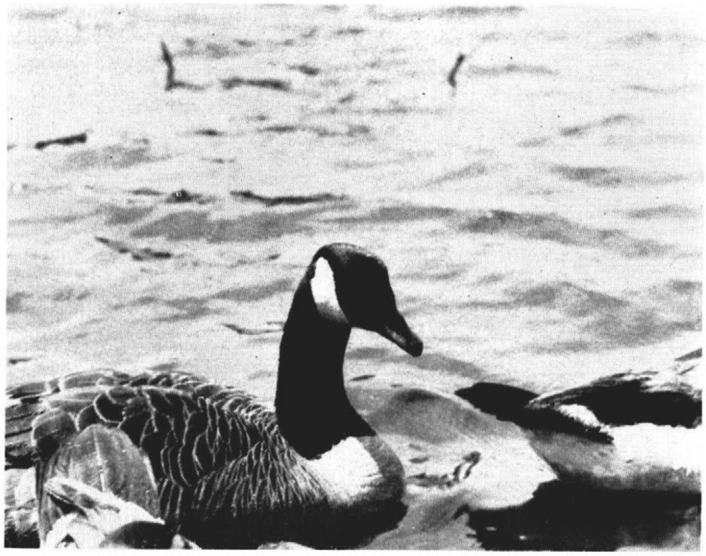

***Figure 17.*—Canada geese resting on shallow water that has been impounded for waterfowl in an area of Tidal marsh.**

cides, damages these feeding grounds. Damage is also caused by shore erosion and by deposition of soil material washed from the uplands. However, material washed from uplands and marshes supplies food for fish.

Fish, oysters, clams, and crabs are plentiful in Chesapeake Bay and in the larger rivers and their estuaries. This marine life supplies large commercial yields each year and also provides recreation for many sports fishermen.

Elements of Wildlife Habitats.—Table 8 shows the suitability of the soils for elements of wildlife habitats. In that table the soils are given a rating of *good*, or above average; *fair*, or average; *poor*, or below average; or *not suited*. Ratings are given for the following elements:

Grain and seed crops. The soils are rated according to their suitability for corn, soybeans, sorghum, millet, buckwheat, wheat, cowpeas, oats, barley, rye, and other grains or grainlike seeds used by wildlife.

Grasses and legumes. The soils are rated according to their suitability for planted grasses and legumes commonly used for forage. Valuable plants for wildlife food and cover are alfalfa, the lespedezas, alsike clover, Ladino clover, red clover, tall fescue, bromegrass, bluegrass, and timothy.

Wild herbaceous upland plants. The soils are rated according to their suitability for native annuals or other herbaceous plants that commonly grow in upland areas. Among these are some of the panics and other native grasses, partridge peas, beggarticks, various native lespedezas, and other native herbs that may be used for food and cover by various kinds of wildlife.

Hardwood trees and shrubs. The soils are rated according to their suitability for hardwood trees and shrubs, either native or planted, that grow vigorously and produce heavy crops of fruit or seed.

Table 8.—*Suitability of soils for elements of*

[Gravel and borrow pits (Gr) and Made land (Ma)

Soil series and map symbols	Elements of wildlife habitats			
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood trees and shrubs
Bayboro:				
Ba	Not suited	Poor	Poor	Good
Bertie:				
BoA	Fair	Fair	Good	Good
BoB2	Good	Good	Good	Good
Bibb:				
Bp	Poor	Fair	Fair	Good
Bladen:				
Bt	Not suited	Poor	Poor	Good
Butlertown:				
BuA	Fair	Good	Good	Good
BuB2, BuC2	Fair	Good	Good	Good
BuC3	Poor	Fair	Good	Good
Coastal beaches:				
Cb	Not suited	Not suited	Not suited	Not suited
Downer:				
DoA, DoB, DoC, DoC3, DoD	Fair	Good	Good	Good
DoD3, DoE	Not suited	Poor	Good	Good
Elkton:				
Ek, EnA	Poor	Fair	Fair	Good
EnB2	Poor	Fair	Fair	Good

Among these plants are dogwood, sumac, sassafras, persimmon, hazelnut, multiflora rose, shrub lespedezas, wild cherry, autumn olive, various oaks and hickories, blueberry, bayberry, huckleberry, blackhaw, sweetgum, highbush cranberry, and various hollies.

Coniferous trees and shrubs. The soils are rated according to their suitability for coniferous trees and shrubs that are native or are planted. Examples are Virginia pine, loblolly pine, shortleaf pine, Scotch pine, red pine, pond pine, Norway spruce, redcedar, and Atlantic white-cedar. The rating is based on whether young plants grow rapidly and develop dense foliage, not on the size of mature plants. A soil that is good for growing Christmas trees rates high.

Wetland plants for food and cover. The soils are rated according to their suitability for wetland plants that provide food and cover for waterfowl and furbearing animals. Examples are wildrice, millet (fig. 18), smartweed, bulrush, barnyard grass, duckweed, pondweed, arrow-arum, pickerelweed, cattail, waterwillow, and various sedges.

Shallow water developments. The soils are rated according to their suitability for the construction of impoundments in which shallow water can be maintained at a desired level. On soils suitable for these impoundments, the water can be controlled at a level ranging from the natural water table to within 2 feet above it.

Excavated ponds. The soils are rated according to their suitability for the construction of dug-out areas or combinations of dug-out ponds and low dikes. These excavated ponds must hold enough water of suitable quality and at a suitable depth to support fish or wildlife. The level of water in the ponds normally fluctuates with the level of ground water.

***Figure 18.*—Millet sown for waterfowl in a shallow impoundment of fresh water. Island in background is used by wild birds for nesting.**

wildlife habitats and for kinds of wildlife

are not rated, because they are too variable]

Elements of wildlife habitats—Continued				Kinds of wildlife		
Coniferous trees and shrubs	Wetland plants for food and cover	Shallow water developments	Excavated ponds	Open-land wildlife	Woodland wildlife	Wetland wildlife
Good	Good	Good	Good	Poor	Good	Good.
Poor	Fair	Fair	Fair	Good	Good	Fair.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Fair	Fair	Poor	Not suited	Fair	Good	Poor.
Good	Good	Good	Good	Poor	Good	Good.
Poor	Poor	Poor	Poor	Good	Good	Poor.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Fair	Fair	Not suited.
Not suited	Not suited	Not suited	Not suited	Not suited	Not suited	Not suited.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Poor	Fair	Not suited.
Fair	Good	Good	Good	Fair	Good	Good.
Fair	Poor	Not suited	Not suited	Fair	Good	Not suited.

TABLE 8.—*Suitability of soils for elements of wildlife*

Soil series and map symbols	Elements of wildlife habitats			
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood trees and shrubs
Fallsington:				
FaA, FdA	Poor	Fair	Fair	Good
FaB, FdB	Poor	Fair	Fair	Good
Galestown:				
GaB, GaC, GcB	Poor	Poor	Poor	Poor
GkD, GkE, GlC	Not suited	Not suited	Poor	Poor
Johnston:				
Jo	Not suited	Poor	Poor	Good
Keyport:				
KeA, KpA	Fair	Good	Good	Good
KeB2, KpB2	Fair	Good	Good	Good
KrC3, KrD3	Not suited	Poor	Good	Good
Klej:				
KsA	Poor	Fair	Fair	Fair
KsB	Poor	Fair	Fair	Fair
Lakeland:				
LaB, LaC	Poor	Poor	Poor	Poor
Matapeake:				
MbA, McA, MkA, MoA	Good	Good	Good	Good
MbB2, MbC2, McB2, McC2, MkB2, MkC2, MoB2, MoC2.	Fair	Good	Good	Good
MbC3, McC3, MmD, MkC3, MoC3	Poor	Fair	Good	Good
MmD3, MmE	Not suited	Poor	Good	Good
Mattapex:				
MpA, MsA, MtA	Fair	Good	Good	Good
MpB2, MsB2, MsC2, MtB2, MtC2	Fair	Good	Good	Good
MsC3, MtC3, MxD	Poor	Fair	Good	Good
MxD3, MxE	Not suited	Poor	Good	Good
Mixed alluvial land:				
My	Poor	Poor	Poor	Good
Othello:				
ObA, BoA	Poor	Fair	Fair	Good
ObB2, BoB2, OeC2	Poor	Fair	Fair	Good
Plummer:				
Pd	Poor	Poor	Fair	Fair
Pocomoke:				
Pk, Pm	Poor	Fair	Fair	Good
Portsmouth:				
Po	Not suited	Poor	Poor	Good
Sassafras:				
SfA	Good	Good	Good	Good
SaA, SaB2, SaC2, SfB2, SfC2	Fair	Good	Good	Good
SaC3, SaD2, SfC3, SfD2	Poor	Fair	Good	Good
SaD3, SaE, SfD3, SfE, SfE3, SfF	Not suited	Poor	Good	Good
Swamp:				
Sw	Not suited	Not suited	Not suited	Not suited
Tidal marsh:				
Tm	Not suited	Not suited	Not suited	Not suited
Woodstown:				
WdA, WoA	Fair	Good	Good	Good
WdB2, WoB2, WoC2	Fair	Good	Good	Good
WoD	Poor	Fair	Good	Good
WoE	Not suited	Poor	Good	Good

habitats and for kinds of wildlife—Continued

Elements of wildlife habitats—Continued				Kinds of wildlife		
Coniferous trees and shrubs	Wetland plants for food and cover	Shallow water developments	Excavated ponds	Open-land wildlife	Woodland wildlife	Wetland wildlife
Fair	Good	Good	Good	Fair	Good	Good.
Fair	Poor	Not suited	Not suited	Fair	Good	Not suited.
Fair	Not suited	Not suited	Not suited	Poor	Poor	Not suited.
Fair	Not suited	Not suited	Not suited	Not suited	Poor	Not suited.
Good	Good	Poor	Not suited	Poor	Good	Fair.
Poor	Poor	Poor	Poor	Good	Good	Poor.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Poor	Good	Not suited.
Poor	Poor	Poor	Poor	Fair	Poor	Poor.
Poor	Not suited	Not suited	Not suited	Fair	Poor	Not suited.
Fair	Not suited	Not suited	Not suited	Poor	Poor	Not suited.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Fair	Fair	Not suited.
Poor	Not suited	Not suited	Not suited	Poor	Fair	Not suited.
Poor	Poor	Poor	Poor	Good	Good	Poor.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Fair	Fair	Not suited.
Poor	Not suited	Not suited	Not suited	Poor	Fair	Not suited.
Good	Good	Poor	Not suited	Poor	Good	Fair.
Fair	Good	Good	Good	Fair	Good	Good.
Fair	Poor	Not suited	Not suited	Fair	Good	Not suited.
Fair	Good	Good	Good	Fair	Fair	Good.
Fair	Good	Good	Good	Fair	Good	Good.
Good	Good	Good	Good	Poor	Good	Good.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Fair	Fair	Not suited.
Poor	Not suited	Not suited	Not suited	Poor	Fair	Not suited.
Not suited	Good	Good	Good	Not suited	Not suited	Good.
Not suited	Good	Poor	Not suited	Not suited	Not suited	Fair.
Poor	Poor	Poor	Poor	Good	Good	Poor.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Fair	Fair	Not suited.
Poor	Not suited	Not suited	Not suited	Poor	Fair	Not suited.

Farm ponds of the impounded type are not included in table 8, but they can be important in producing fresh-water fish. If fish are to be produced, part of the pond should be at least 6 feet deep. Table 12 in the subsection "Engineering Uses of Soils" gives properties of each soil in the county that affect the construction and maintenance of farm ponds.

Suitability of the Soils for Different Kinds of Wildlife.—Table 8 rates the soils according to their suitability for three kinds of wildlife in the county. The ratings are based on a weighted average of the ratings given to elements of habitats in that table.

Suitability of Tidal Marsh for Wildlife.—Areas of Tidal marsh in Queen Annes County produce a good growth of wetland plants that furnish food and cover for waterfowl, muskrat, and certain other kinds of wildlife. Tidal marsh also is fairly suitable for shallow water developments.

Different marsh types are recognized in the State on the basis of dominant vegetation (*6*, *13*). Four of these types—I, II, IV, and V—occur in Queen Annes County. These types are described in the following paragraphs and, in table 9, are rated according to their suitability for muskrat, raccoon, rail, nesting ducks, Wilson's snipe, migratory ducks, and geese.

Type I is called the cattail type, though the vegetation also includes pickerelweed, wildrice, arrow-arum, spatterdock, rice cutgrass, American three-square, spikerush, sedge, wildmillet, and smartweed. This type occupies about 27 percent of the marshland in the county and is along the upper reaches of tidal streams. In these places there is little tidal action, and the water is nearly fresh or only slightly saline. Muskrats are numerous, and various kinds of rail are abundant. Food of high quality makes the areas excellent for migratory waterfowl and for waterfowl that spend the winter here. Except along the fringes, where wood ducks sometimes nest, there is little nesting.

Figure 19.—**Needlerush is one of the most abundant plants in type V marsh.**

Type II is a transitional type that occupies about 12 percent of the marshland in the county. In addition to most of the vegetation that occurs in type I, type II marsh has many plants that are more tolerant of salt than those in type I. These salt-tolerant plants are Olney's three-square, saltmarsh bulrush, big cordgrass, smooth cordgrass, and marshhay cordgrass. In most places there are many muskrats, and Wilson's snipe, locally called jacksnipe, commonly is abundant during migrations in spring and fall. In addition, there are several kinds of rail. Many kinds of waterfowl spend the winter where this marsh type is dominant, and black duck and blue-winged teal nest here.

Type IV is called the three-square-cordgrass-needlerush type. In the areas where it is dominant, Olney's three-square, needlerush, marshhay cordgrass, and smooth cordgrass make up about equal parts of the plant cover, and saltmarsh bulrush grows in some places. This type occupies about 3 percent of the marshland in the county and is of little importance. The areas are relatively dry and are only occasionally flooded by high tides. Muskrats are usually not numerous, but rails, black ducks, blue-winged teal, and small songbirds may build their nests here. Migratory ducks may be common.

Type V marsh is the needlerush-saltmeadow cordgrass type (fig. 19). It is the most extensive and most important type in the county and makes up about 58 percent of the marshland. It occurs in fairly high areas that are not frequently flooded. High-tide bush, groundsel bush, and switchgrass are common plants in some of the higher areas. The type is particularly important on Kent Island and in areas just east and south of Kent Narrows. Large numbers of black ducks and small songbirds may build their nests in areas of type V marsh. Both migrating and wintering waterfowl are usually less numerous than in areas along tidal waterways and ponds; muskrats are not abundant; and there are few other animals.

In the management of marshland, it is important that the areas be kept free of pollution by salt water. The more salty areas can be freshened by digging small holes, or ponds, a few feet in diameter that are connected by ditches containing small water-control structures. Rainfall collected in the ponds is spread through the ditches to other parts of the marshes. Spreading fresh water in this way helps to maintain the desirable plants and encourages use of the marshland by waterfowl and muskrat.

Larger ponds that have special structures for controlling water can be built in many places. Ponds of this kind are most suitable in type V marsh that is dominated by needlegrass or cordgrass, either of which is of little value to ducks (*4*). The areas selected can be enclosed by dikes that keep the water about 2 feet deep.

TABLE 9.—*Suitability of marsh for species of wildlife*

Species of wildlife	Type I	Type II	Type IV	Type V
Muskrat	Excellent food and cover	Excellent food and cover	Fair food and cover	Poor food and cover.
Raccoon	Excellent food and cover	Excellent food and cover	Fair food and cover	Poor food and cover.
Rail	Excellent	Excellent	Excellent for nesting	Poor.
Nesting ducks	Excellent for wood ducks	Good	Excellent for teal and black ducks.	Good for black ducks.
Wilson's snipe	(1)	Excellent	(1)	(1).
Migratory ducks	Excellent	Excellent	Good	Good.
Geese	Good	Good	Poor	Poor.

1 Not rated.

Some areas of marshland should not be drained, because they are made up of soil material called cat clay. This material, which must be identified on the site, contains large amounts of sulfur compounds. If the excess water is removed, oxidation of these compounds results in the formation of sulfuric acid that kills vegetation and makes the affected areas practically worthless.

Engineering Uses of Soils

This subsection has five main parts. In the first part, the soils of the county are described from an engineering viewpoint and properties important in engineering are described. The second part interprets properties as they relate to engineering work. The third part consists of data obtained by testing samples of soils taken at a number of locations. Soils are grouped, in the fourth part, according to the similarity of their drainage requirements. In the fifth part, soils are grouped according to their suitability for irrigation.

This subsection of the report is a guide to the properties of the soils and to the influence of those properties on problems related to engineering. In part, the information was obtained by examining the soils in the field and by evaluating their characteristics with reference to engineering needs. Chiefly, however, the subsection is based on facts obtained by testing soil samples taken at fourteen locations in the county. Use was also made of reports and analyses made in Somerset County, Md., Norfolk County, Va., and elsewhere.

With the use of the soil map for identification, the engineering interpretations in this subsection can be useful for many purposes. It should be emphasized that they may not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and where the excavations are deeper than the depths of layers here reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected. For example, the information in this section shows that Bayboro silt loam is not suitable for road fill or as a source of sand or gravel. It also shows that the Sassafras soils are suitable for use in constructing dikes, levees, and embankments. It does not show, however, just how good the Sassafras soils are for dikes, levees, or embankments in any particular area of these soils. Tests at the site will be required to obtain that information.

This report contains information that can be used by engineers to—

1. Make soil and land use studies that will aid in selecting and developing industrial, business, residential, and recreational sites.
2. Assist in designing drainage and irrigation systems and in planning farm ponds, diversion terraces, and structures for soil and water conservation or for other purposes.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting locations for highways, airports, pipelines, and cables and in planning detailed investigations of the selected locations.
4. Locate probable sources of sand, gravel, and other construction material.
5. Correlate performance of engineering structures with kinds of soil and thus develop information that will be useful in designing and maintaining the structures.
6. Determine the suitability of soil mapping units for cross-country movement of vehicles and construction equipment.
7. Supplement the information obtained from other published maps and reports and from aerial photographs that can be readily used by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

Engineering descriptions and physical properties

A brief description of each soil in Queen Annes County is given in table 10. The table lists the symbol for each soil that is shown on the detailed soil map and the name of the soil. For each significant horizon the table shows also the textural classification generally used by the U.S. Department of Agriculture and the two most widely used engineering classifications—those of the American Association of State Highway Officials (*1*) and of the United States Army, Corps of Engineers (*14*). Color and other characteristics that are not important in engineering have been omitted from most descriptions, but other general characteristics of the profile are described. Among these are the kind of parent material or other substratum, drainage characteristics, depth to the water table if this factor is known and is significant, and the presence of gravel or sand.

Unless otherwise indicated, the descriptions of the physical properties in table 10 apply to the soils that are

TABLE 10.—*Descriptions of the soils*

[Dashed lines indicate information

Map symbol	Mapping unit [1]	Description of soil and site	Depth from surface	Classification: USDA texture
			Inches	
Ba	Bayboro silt loam.	About 1 foot of black, highly organic silt loam, over 3 to 5 feet of mottle clay or silty clay, over fine sandy clay substratum; very poorly drained; seasonally high water table at surface.	0–12 12–50	Silt loam Silty clay or clay
BoA BoB2	Bertie and Othello silt loams, 0 to 2 percent slopes (Bertie part). Bertie and Othello silt loams, 2 to 5 percent slopes, moderately eroded (Bertie part).	About 15 inches of silt loam, over 18 inches of light silty clay loam, over light sandy loam grading to sand with depth; somewhat poorly drained; seasonally high water table at depth of 18 inches or less. For description of Othello soils in undifferentiated groups BoA and BoB2, see Othello silt loams.	0–15 15–34 34–60	Silt loam Light silty clay loam Sand to light sandy loam.
Bp	Bibb silt loam.	About 3 feet of silt loam over unconforming clay; on poorly drained flood plains; seasonally high water table at depth of 1 foot or less.	0–37 37–50	Silt loam Clay
Bt	Bladen silty clay loam.	About 1 foot of silty clay loam, over 4 feet of clay, over fine sandy clay; poorly drained; seasonally high water table at depth of 1 foot or less.	0–11 11–44 44–60	Silty clay loam Clay Fine sandy clay
BuA BuB2 BuC2 BuC3	Butlertown silt loam, 0 to 2 percent slopes. Butlertown silt loam, 2 to 5 percent slopes, moderately eroded. Butlertown silt loam, 5 to 10 percent slopes, moderately eroded. Butlertown silt loam, 5 to 10 percent slopes, severely eroded.	About 10 inches of silt loam, over 36 to 40 inches of heavy silt loam or light silty clay loam, over silt or silt loam to depth of 5 feet or more; may overlie very fine sand; moderately well drained; seasonally high water table at depth of 2½ to 3 feet.	0–10 10–49 49–60	Silt loam Heavy silt loam or light silty clay loam. Silt loam
Cb	Coastal beaches.	Loose sand; slightly to strongly saline; water table below depth of 4 feet, except where influenced by tides.	0–60	Sand
DoA DoB DoC DoC3 DoD DoD3 DoE	Downer loamy sand, 0 to 2 percent slopes. Downer loamy sand, 2 to 5 percent slopes. Downer loamy sand, 5 to 10 percent slopes. Downer loamy sand, 5 to 10 percent slopes, severely eroded. Downer loamy sand, 10 to 15 percent slopes. Downer loamy sand, 10 to 15 percent slopes, severely eroded. Downer loamy sand, 15 to 30 percent slopes.	About 18 inches of loamy sand, over 14 inches of sandy loam, over deep loamy sand or sand; well drained; water table below depth of 4 feet at all times.	0–18 18–32 32–42 42–60	Loamy sand Sandy loam Loamy sand Sand
Ek EnA EnB2	Elkton loam. Elkton silt loam, 0 to 2 percent slopes. Elkton silt loam, 2 to 5 percent slopes, moderately eroded.	About 7 inches of silt loam or loam over 54 inches of silty clay; may overlie sandy material; poorly drained; seasonal water table at depth of 1 foot or less. Elkton soil in undifferentiated group OeC2 is as decribed here; see Othello silt loam for description of Othello soil.	0–7 7–60	Silt loam or loam Silty clay
FaA FaB FdA FdB	Fallsington loam, 0 to 2 percent slopes. Fallsington loam, 2 to 5 percent slopes. Fallsington sandy loam, 0 to 2 percent slopes. Fallsington sandy loam, 2 to 5 percent slopes.	About 16 inches of loam or sandy loam, over 16 inches of sandy clay loam, over stratified loamy sand with some gravel; poorly drained; seasonally high water table at depth of 1 foot or less.	0–16 16–35 35–50+	Sandy loam or loam Sandy clay loam Gravelly loamy sand
GaB GaC GcB	Galestown loamy sand, clayey substratum, 0 to 5 percent slopes. Galestown loamy sand, clayey substratum, 5 to 10 percent slopes. Galestown sand, clayey substratum, 0 to 5 percent slopes.	About 5 feet of sand or loamy sand, grading to sand, over sandy loam or sandy clay loam substratum; somewhat excessively or excessively drained, water table within finer textured substratum.	0–39 39–55 55–60	Loamy sand or sand Sand Sandy loam

See footnote at end of table.

and estimates of their properties

not applicable or not available]

Classification—Continued		Percentage passing sieve—			Range in permeability	Available moisture capacity	Reaction	Maximum dry density	Optimum moisture	Shrink-swell potential
Unified	AASHO	No. 4	No. 10	No. 200						
					Inches per hour	*Inches per inch of soil*	*pH*	*Lb. per cu. ft.*	*Percent*	
MH or OH	A-7	100	100	95–100	0.20–0.63	0.20	4.0–4.5	----------	----------	High.
CH or CL	A-7	100	100	95–100	<0.20	.18	3.5–5.0	100–110	20	High.
ML	A-4	100	100	85–95	0.20–0.63	.16	4.0–5.0	----------	----------	Low.
ML or CL	A-4 or A-6	100	100	85–95	0.20–0.63	.18	4.0–5.0	101–110	14	Moderate.
SM	A-2	100	100	10–25	0.63–2.0	.08	4.0–4.5	111–120	12	Very low.
ML or CL	A-4 or A-6	100	100	85–95	0.20–0.63	.16	4.0–5.0	101–110	18	Low to moderate.
CL or CH	A-6 or A-7	100	100	95–100	<0.20	.18	3.5–4.0	91–100	20	Moderate to high.
CL	A-6	100	100	90–100	0.20–0.63	.17	4.5–5.0	----------	----------	Moderate.
CL or CH	A-7	100	100	95–100	<0.20	.18	4.0–5.0	91–100	20	High.
CL	A-6	100	100	75–90	<0.20	.17	5.0–5.5	101–110	18	Moderate.
ML or CL	A-4	100	100	90–100	0.20–2.0	.16	5.0–6.0	----------	----------	Low.
ML or CL	A-4 or A-6	100	100	85–100	<0.20	.17	5.0–6.0	101–110	18	Moderate.
ML	A-4	100	100	70–100	0.20–0.63	.16	5.0–5.5	101–110	18	Low.
SP	A-3	100	100	0–5	6.3+	----------	----------	101–110	8	Low.
SM	A-2	100	100	15–30	2.0–6.3	.10	4.5–5.5	101–110	12	Low.
SM	A-2, A-4	100	100	25–40	0.63–2.0	.14	4.5–5.0	111–120	14	Low.
SM	A-2	100	100	15–25	2.0–6.3	.10	5.0–6.0	101–110	10	Low.
SP or SP-SM.	A-3	100	100	0–10	6.3+	.06	5.0–6.0	91–100	10	Low.
ML	A-4	100	100	75–90	0.20–2.0	.16	4.0–5.0	----------	----------	Moderate.
CL	A-6	100	100	80–95	<0.20	.18	4.0–5.0	91–100	20	Moderate.
SM or ML	A-2 or A-4	100	100	30–50	0.20–2.0	.15	4.0–5.0	----------	----------	Low.
SC or CL	A-2 or A-6	100	100	30–55	0.63–2.0	.17	4.0–5.0	111–120+	14	Low.
SM or SP	A-2 or A-3	95–100	75–100	5–15	2.0–6.3	.10	4.0–5.0	101–120	12	Low.
SP-SM or SM.	A-2 or A-3	100	100	5–15	2.0–6.3+	.08	4.5–5.0	101–110	10	Low.
SP or SP-SM.	A-3	100	100	0–10	6.3+	.06	4.0–5.0	91–100	10	Low.
SC or SM	A-2	100	100	15–30	0.20–2.0	.15	4.0–5.0	111–120+	15	Low.

TABLE 10.—*Descriptions of the soils and*

Map symbol	Mapping unit [1]	Description of soil and site	Depth from surface	Classification
				USDA texture
			Inches	
GkD	Galestown and Lakeland loamy sands, 10 to 15 percent slopes.	Six feet or more of sand, or loamy sand grading to sand; excessively drained; water table below depth of 6 feet at all times.	0–39	Loamy sand or sand
GkE	Galestown and Lakeland loamy sands, 15 to 30 percent slopes.		39–72	Sand
GlC	Galestown and Lakeland sands, 5 to 10 percent slopes.			
Jo	Johnston loam.	About 30 inches of organic loam, over 10 inches of loamy fine sand, over fine sandy clay substratum; on very poorly drained flood plains; seasonally high water table at depth of 1 foot or less; subject to flooding and ponding.	0–30	Loam
			30–41	Loamy fine sand
			41–50	Fine sandy clay
KeA	Keyport loam, 0 to 2 percent slopes.	About 9 inches of loam, silt loam, or silty clay loam, over 4 feet or more of silty clay loam to clay; moderately well drained; seasonally high water table at depth of about 2 feet.	0–9	Silt loam or loam
KeB2	Keyport loam, 2 to 5 percent slopes, moderately eroded.		9–35	Silty clay loam to clay
KpA	Keyport silt loam, 0 to 2 percent slopes.		35–55	Clay or silty clay
KpB2	Keyport silt loam, 2 to 5 percent slopes, moderately eroded.			
KrC3	Keyport silty clay loam, 5 to 10 percent slopes, severely eroded.			
KrD3	Keyport silty clay loam, 10 to 15 percent slopes, severely eroded.			
KsA	Klej loamy sand, 0 to 2 percent slopes.	About 40 inches of loamy sand, over several inches of sand, over heavy sandy loam; moderately well drained; seasonally high water table at depth of about 2 feet.	0–39	Loamy sand
KsB	Klej loamy sand, 2 to 5 percent slopes.		39–47	Sand
			47–55	Sandy loam
LaB	Lakeland loamy sand, clayey substratum, 0 to 5 percent slopes.	About 5 feet of loamy sand grading to sand, over sandy loam or sandy clay loam substratum; somewhat excessively or excessively drained; water table seasonally within finer textured substratum.	0–33	Loamy sand
LaC	Lakeland loamy sand, clayey substratum, 5 to 10 percent slopes.		33–58	Sand
			58–66	Sandy loam
MbA	Matapeake fine sandy loam, 0 to 2 percent slopes.	About 11 inches of fine sandy loam, loam, or silt loam, over about 20 inches of silty clay loam, over fine sandy clay loam grading to fine sandy loam and loamy sand; well drained; water table below depth of 4 feet at all times.	0–11	Fine sandy loam, loam, or silt loam.
MbB2	Matapeake fine sandy loam, 2 to 5 percent slopes, moderately eroded.		11–32	Silty clay loam
MbC2	Matapeake fine sandy loam, 5 to 10 percent slopes, moderately eroded.		32–37	Fine sandy clay loam
			37–50	Fine sandy loam
MbC3	Matapeake fine sandy loam, 5 to 10 percent slopes, severely eroded.			
McA	Matapeake loam, 0 to 2 percent slopes.			
McB2	Matapeake loam, 2 to 5 percent slopes, moderately eroded.			
McC2	Matapeake loam, 5 to 10 percent slopes, moderately eroded.			
McC3	Matapeake loam, 5 to 10 percent slopes, severely eroded.			
MkA	Matapeake silt loam, 0 to 2 percent slopes.			
MkB2	Matapeake silt loam, 2 to 5 percent slopes, moderately eroded.			
MkC2	Matapeake silt loam, 5 to 10 percent slopes, moderately eroded.			
MkC3	Matapeake silt loam, 5 to 10 percent slopes, severely eroded.			
MmD	Matapeake soils, 10 to 15 percent slopes.			
MmD3	Matapeake soils, 10 to 15 percent slopes, severely eroded.			
MmE	Matapeake soils, 15 to 30 percent slopes.			
MoA	Matapeake silt loam, silty substratum, 0 to 2 percent slopes.	About 16 inches of silt loam, over 40 inches of light silty clay loam or heavy silt loam, over silt or silt loam to depth of 6 feet or more; well drained; water table below depth of 6 feet at all times.	0–16	Silt loam
MoB2	Matapeake silt loam, silty substratum, 2 to 5 percent slopes, moderately eroded.		16–55	Light silty clay loam
MoC2	Matapeake silt loam, silty substratum, 5 to 10 percent slopes, moderately eroded.		55–72	Silt loam or silt

See footnote at end of table.

estimates of their properties—Continued

Classification—Continued		Percentage passing sieve—			Range in permeability	Available moisture capacity	Reaction	Maximum dry density	Optimum moisture	Shrink-swell potential
Unified	AASHO	No. 4	No. 10	No. 200						
					Inches per hour	*Inches per inch of soil*	*pH*	*Lb. per cu. ft.*	*Percent*	
SP–SM or SM.	A–2 or A–3	100	100	5–15	2.0–6.3+	0.08	4.5–5.0	101–110	10	Low.
SP or SP–SM.	A–3	100	100	0–10	6.3+	.06	4.0–5.0	91–100	10	Low.
SM or OL	A–4 or A–5	100	100	35–50	0.20–0.63	.20	4.0–5.5	----------	----------	Low to moderate
SP–SM or SM.	A–2 or A–3	100	95–100	5–15	0.63–2.0	.08	3.5–40.	101–110	10	Low.
CL	A–6	100	100	50–80	<0.20	.18	3.5–4.5	101–110	18	Moderate.
ML	A–4	100	100	60–80	0.20–2.0	.16	5.0–5.5	----------	----------	Low.
CL	A–6	100	100	60–90	<0.20	.18	4.5–5.0	91–100	20	Moderate.
CH or CL	A–7 or A–6	100	100	80–100	<0.20	.18	4.0–4.5	91–100	20	Moderate.
SM	A–2	100	100	10–20	0.63–2.0	.08	4.0–5.0	101–110	10	Low.
SP or SP–SM.	A–3	100	100	0–10	2.0–6.3	.06	4.0–4.5	91–100	10	Low.
SM or SC	A–2	100	100	15–30	0.20–2.0	.15	3.5–4.0	111–120	15	Low.
SM–SP or SM.	A–2	100	100	10–15	2.0–6.3+	.06	4.5–5.0	105–110	10	Low.
SP or SM–SP.	A–3	100	100	0–10	6.3+	.06	4.0–4.5	105–110	10	Low.
SC or SM	A–2	100	100	15–30	0.20–2.0	.15	4.0–5.0	111–120	14	Moderate.
ML	A–4	100	100	60–80	0.63–2.0	.16	5.0–6.0	----------	----------	Low.
CL	A–6	100	100	60–85	0.63–2.0	.18	5.0–6.0	101–110	18	Moderate.
SC or CL	A–6	100	100	40–60	0.63–2.0	.15	5.0–5.5	111–120	16	Moderate.
SM	A–2	100	100	15–30	2.0–6.3	.14	5.0–5.5	111–120	15	Low.
ML	A–4	100	100	90–95	0.63–2.0	.16	5.5–6.5	----------	----------	Low.
ML or CL	A–4 or A–6	100	100	95–100	0.63–2.0	.18	5.5–6.5	101–110	18	Low to moderate
ML	A–4	100	100	95–100	0.63–2.0	.16	5.5–6.0	101–110	18	Low.

TABLE 10.—*Descriptions of the soils and*

Map symbol	Mapping unit [1]	Description of soil and site	Depth from surface	Classification
				USDA texture
			Inches	
MoC3	Matapeake silt loam, silty substratum, 5 to 10 percent slopes, severely eroded.			
MpA	Mattapex fine sandy loam, 0 to 2 percent slopes.	About 15 inches of fine sandy loam, loam, or silt loam, over about 20 inches of light silty clay loam, over deep sandy loam that is coarser textured with depth; moderately well drained; seasonally high water table at depth of about 2 feet.	0–15	Fine sandy loam, loam, or silt loam.
MpB2	Mattapex fine sandy loam, 2 to 5 percent slopes, moderately eroded.		15–36	Light silty clay loam
MsA	Mattapex loam, 0 to 2 percent slopes.		36–50	Light fine sandy loam
MsB2	Mattapex loam, 2 to 5 percent slopes, moderately eroded.			
MsC2	Mattapex loam, 5 to 10 percent slopes, moderately eroded.			
MsC3	Mattapex loam, 5 to 10 percent slopes, severely eroded.			
MtA	Mattapex silt loam, 0 to 2 percent slopes.			
MtB2	Mattapex silt loam, 2 to 5 percent slopes, moderately eroded.			
MtC2	Mattapex silt loam, 5 to 10 percent slopes, moderately eroded.			
MtC3	Mattapex silt loam, 5 to 10 percent slopes, severely eroded.			
MxD	Mattapex soils, 10 to 15 percent slopes.			
MxD3	Mattapex soils, 10 to 15 percent slopes, severely eroded.			
MxE	Mattapex soils, 15 to 30 percent slopes.			
My	Mixed alluvial land.	Mixed soil materials on flood plains; subject to flooding.	--------	Variable
ObA	Othello silt loam, 0 to 2 percent slopes.	About 9 inches of silt loam, over 20 inches of light silty clay loam, over compact sandy loam grading to loose loamy sand; poorly drained; seasonally high water table at depth of 1 foot or less. Othello silt loam in undifferentiated groups BoA and BoB2 is as described here; see Bertie and Othello silt loams for description of Bertie soil.	0–9	Silt loam
ObB2	Othello silt loam, 2 to 5 percent slopes, moderately eroded.		9–29	Light silty clay loam
OeC2	Othello and Elkton soils, 5 to 10 percent slopes, moderately eroded (Othello part).		29–34	Sandy loam
			34–48	Loamy sand
Pd	Plummer loamy sand.	About 28 inches of loamy sand, over sand to depth of about 46 inches, over sandy loam substratum; poorly drained; seasonally high water table at depth of 1 foot or less; ponded in some areas.	0–28	Loamy sand
			28–46	Sand
			46–60	Sandy loam
Pk	Pocomoke loam.	About 14 inches of loam or sandy loam, over about 12 inches of sandy clay loam or heavy sandy loam, over loose loamy sand; surface layer high in organic-matter content; very poorly drained; seasonally high water table at or near surface; ponded in some areas.	0–14	Sandy loam or loam
Pm	Pocomoke sandy loam.		14–26	Sandy clay loam or heavy sandy loam.
			26–53	Loamy sand
Po	Portsmouth silt loam.	About 11 inches of highly organic silt loam, over 2 feet of silty clay loam, over loamy sand or very light sandy loam; very poorly drained; seasonally high water table at or near surface; ponded in some areas.	0–11	Silt loam
			11–37	Silty clay loam
			37–48	Loamy sand or light sandy loam.
SaA	Sassafras loam, 0 to 2 percent slopes.	About 14 inches of loam or sandy loam, over about 30 inches of sandy clay loam, over deep loamy sand; well drained; water table below depth of 4 feet at all times.	0–14	Sandy loam or loam
SaB2	Sassafras loam, 2 to 5 percent slopes, moderately eroded.		14–43	Sandy clay loam
SaC2	Sassafras loam, 5 to 10 percent slopes, moderately eroded.		43–50	Loamy sand
SaC3	Sassafras loam, 5 to 10 percent slopes, severely eroded.			
SaD2	Sassafras loam, 10 to 15 percent slopes, moderately eroded.			

See footnote at end of table.

estimates of their properties—Continued

Classification—Continued		Percentage passing sieve—			Range in permeability	Available moisture capacity	Reaction	Maximum dry density	Optimum moisture	Shrink-swell potential
Unified	AASHO	No. 4	No. 10	No. 200						
					Inches per hour	*Inches per inch of soil*	*pH*	*Lb. per cu. ft.*	*Percent*	
ML	A-4	100	95-100	50-70	0. 63-2. 0	0. 16	5. 0-6. 0			Low.
ML or CL	A-4 or A-6	100	100	60-90	0. 20-0. 63	. 18	4. 5-5. 5	101-110	18	Moderate.
SM or SC	A-2	100	95-100	15-35	0. 63-2. 0	. 15	4. 0-5. 0	111-120	15	Low.
ML	A-4	100	100	85-95	0. 20-0. 63	. 16	4. 5-5. 5			Low.
ML or CL	A-4 or A-6	100	100	85-95	0. 20-0. 63	. 18	4. 5-5. 5	101-110	18	Moderate.
SM	A-2, A-4	100	95-100	20-40	0. 20-0. 63	. 15	4. 0-4. 5	111-120	15	Low.
SM-SP or SM.	A-2	100	95-100	10-20	0. 63-6. 3	. 07	4. 0-5. 0	101-110	10	Low.
SP-SM or SM.	A-3 or A-2	100	100	5-20	0. 63-2. 0	. 08	4. 0-5. 0	101-110	10	Low.
SP or SP-SM.	A-3	100	100	0-10	2. 0-6. 3+	. 05	4. 0-4. 5	91-100	10	Low.
SC or SM	A-2	100	100	15-30	0. 20-2. 0	. 15	3. 5-4. 0	111-120	15	Low.
SM or ML	A-2 or A-4	100	100	25-50	0. 63-2. 0	. 15	4. 0-4. 5			Low.
SC, SM or ML.	A-2 or A-4	100	100	30-60	0. 63-2. 0	. 17	4. 0-4. 5	111-120+	14	Low.
SM-SP or SM.	A-2	90-100	90-100	10-20	2. 0-6. 3+	. 08	4. 0-4. 5	101-110	10	Low.
ML or OL	A-4 or A-5	100	100	75-95	0. 20-0. 63	. 16	4. 5-5. 0			Low to moderate.
CL	A-6	100	100	85-100	0. 20-0. 63	. 18	4. 0-4. 5	101-110	20	Moderate.
SM-SP or SM.	A-2	100	95-100	10-25	0. 63-2. 0	. 08	3. 5-4. 0	101-110	12	Low.
SM or ML	A-2 or A-4	95-100	90-100	30-55	0. 63-2. 0	. 15	4. 5-5. 0			Low.
SC or CL	A-4 or A-6	100	95-100	35-60	0. 63-2. 0	. 17	4. 5-5. 0	111-120+	14	Low.
SM-SP or SM.	A-2	100	100	10-20	0. 63-6. 3	. 08	4. 0-4. 5	101-110	12	Low.

TABLE 10.—*Descriptions of the soils and*

Map symbol	Mapping unit [1]	Description of soil and site	Depth from surface	Classification
				USDA texture
			Inches	
SaD3	Sassafras loam, 10 to 15 percent slopes, severely eroded.			
SaE	Sassafras loam, 15 to 30 percent slopes.			
SfA	Sassafras sandy loam, 0 to 2 percent slopes.			
SfB2	Sassafras sandy loam, 2 to 5 percent slopes, moderately eroded.			
SfC2	Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded.			
SfC3	Sassafras sandy loam, 5 to 10 percent slopes, severely eroded.			
SfD2	Sassafras sandy loam, 10 to 15 percent slopes, moderately eroded.			
SfD3	Sassafras sandy loam, 10 to 15 percent slopes, severely eroded.			
SfE	Sassafras sandy loam, 15 to 30 percent slopes.			
SfE3	Sassafras sandy loam, 15 to 30 percent slopes, severely eroded.			
SfF	Sassafras sandy loam, 30 to 60 percent slopes.			
Sw	Swamp.	Very wet soil material; generally ponded	--------	Variable
Tm	Tidal marsh.	Saline soil materials; subject to tidal fluctuations.	--------	Variable
WdA	Woodstown loam, 0 to 2 percent slopes.	About 13 inches of loam or sandy loam, over 20 inches of fine sandy clay loam, over light sandy loam that is coarser textured with depth; moderately well drained; seasonally high water table at depth of about 2 feet.	0–13	Sandy loam or loam
WdB2	Woodstown loam, 2 to 5 percent slopes, moderately eroded.		13–34	Fine sandy clay loam
WoA	Woodstown sandy loam, 0 to 2 percent slopes.		34–48	Light sandy loam
WoB2	Woodstown sandy loam, 2 to 5 percent slopes, moderately eroded.			
WoC2	Woodstown sandy loam, 5 to 10 percent slopes, moderately eroded.			
WoD	Woodstown sandy loam, 10 to 15 percent slopes.			
WoE	Woodstown sandy loam, 15 to 30 percent slopes.			

[1] The properties are not shown in this table for Gravel and borrow pits (Gr) and Made land (Ma).

only slightly eroded, but for some soils the degree of erosion, the content of gravel, and other items are indicated.

The thickness of the soil horizons varies somewhat from place to place. The thickness and other properties described in table 10 are those that actually exist in a specific profile of the soil described; they are not an average obtained from a number of profiles. If a soil is severely eroded, little if any of the original surface layer remains, and the underlying horizons are closer to the surface than is indicated in the table.

The rate indicated for permeability is the rate that water moves through undisturbed soil material. It depends largely on the texture and the structure of the soil. Compaction sharply reduces permeability.

Maximum dry density is the greatest amount of soil that can be compacted into any unit of volume. It is expressed as pounds of soil per cubic foot. Optimum moisture is the moisture content at which the maximum dry density of a soil can be obtained by compaction. For any one soil material for a stated compactive effort, there is a specific optimum moisture, below and above which maximum density cannot be obtained.

The shrink-swell potential indicates the volume change that can be expected when the content of soil moisture changes. It is estimated primarily on the basis of the amount and type of clay in a horizon. A soil with a high shrink-swell potential decreases sharply and significantly in volume when it is dried, or conversely, increases sharply and significantly in volume when it is thoroughly wet. Generally, soils classified as CH and A–7 have a high shrink-swell potential. Very sandy soils that contain little clay have low shrink-swell potential, and they shrink and swell very little, if at all.

Soil interpretations for engineering

Table 11 lists estimated suitability ratings of soils for various uses or operations in engineering. Each soil in the county is rated as to its suitability for earthwork, both when the soil is wet and when it is frozen in winter. Also estimated for each series are ratings for the susceptibility to frost action; and the potential corrosion on

estimates of their properties—Continued

Classification—Continued		Percentage passing sieve—			Range in permeability	Available moisture capacity	Reaction	Maximum dry density	Optimum moisture	Shrink-swell potential
Unified	AASHO	No. 4	No. 10	No. 200						
					Inches per hour	*Inches per inch of soil*	*pH*	*Lb. per cu. ft.*	*Percent*	
-----------	-----------	--------	--------	--------	-----------	-----------	--------	--------	--------	
-----------	-----------	--------	--------	--------	-----------	-----------	--------	--------	--------	
SM or ML	A-4	100	100	40–75	0.63–2.0	0.15	4.5–5.0	----------	--------	Low.
SC or CL	A-2, A-4, or A-6.	100	100	40–75	0.63–2.0	.17	4.0–4.5	111–120+	14	Low.
SM, SC, or ML.	A-2 or A-4	100	100	35–50	0.63–2.0	.10	4.0–4.5	101–110	12	Low.

pipes of steel and concrete. The last part of table 11 rates each major horizon as a source of topsoil, sand, gravel, and road fill.

Table 12 gives specific characteristics that affect the suitability of each soil for different kinds of engineering work. The interpretations are based on the information given in tables 10 and 11, on test data given in table 13, and on the experiences of engineers in the field. The features listed are those that affect suitability of the soils for pipelines, roads, or highways; ponds or reservoirs; dikes, levees, dams, and other embankments; drainage systems; irrigation practices; terraces or diversions; and waterways. Shown in the last column of table 12 is the type of pond that is suited to the soils of each series.

A soil that is suitable for one engineering purpose may be poor or even unsuitable for some other use. For example, Bayboro silt loam is well suited as a site for a reservoir but is unsuitable as a source of sand. On the other hand, the Galestown soils are a good source of sand, but they generally are not suitable for a reservoir site, because they are subject to excessive seepage.

795-646—66——5

Table 12 indicates both the good and the undesirable features of a soil that may require special consideration before a structure is planned, designed, and constructed. A subsoil of fine silty clay or clay, such as that in the Bayboro soils, has characteristics that make it poor for an embankment or dam. Such a subsoil is unstable and highly erodible and cannot be compacted to a very high density. Because the subsoil material is very slowly permeable, however, it may be suitable as a core of a dam, used to reduce seepage. Fine texture and slow permeability in a subsoil increase the difficulty of providing adequate drainage for such soils, and they limit the suitability of the soils for irrigation.

The choice of a soil suitable for laying a pipeline is determined primarily by the natural stability of the soil and by the height and seasonal fluctuation of the water table. If the water table is high, laying a line for sewer, water, or gas in wet soils is difficult and frustrating because ditchbanks are likely to collapse. In some soils the banks are unstable even where the water table is not high.

TABLE 11.—*Interpretations of*

Soil series and map symbols [1]	Suitability for earthwork when soil is—		Susceptibility to frost action
	Wet	Frozen	
Bayboro (Ba)	Poor	Not suitable	Severe
Bertie (BoA, BoB2)	Poor	Not suitable	Severe
Bibb (Bp)	Poor	Not suitable	Severe
Bladen (Bt)	Poor	Not suitable	Severe
Butlertown (BuA, BuB2, BuC2, BuC3)	Poor	Not suitable	Severe
Coastal beaches (Cb)	Good	Good	None
Downer (DoA, DoB, DoC, DoC3, DoD, DoD3, DoE)	Good	Fair	Slight
Elkton (Ek, EnA, EnB2, OeC2)	Poor	Not suitable	Severe
Fallsington (FaA, FaB, FdA, FdB)	Fair	Poor	Severe
Galestown:			
(GaB, GaC, GcB)	Good	Good	Slight
(GkD, GkE, GlC)	Good	Good	Slight
Johnston (Jo)	Poor	Not suitable	Severe
Keyport (KeA, KeB2, KpA, KpB2, KrC3, KrD3)	Poor	Not suitable	Severe
Klej (KsA, KsB)	Fair to good	Fair	Moderate
Lakeland:			
(LaB, LaC)	Good	Good	Slight
(GkD, GkE, GlC)	Good	Good	Slight
Matapeake:			
(MbA, MbB2, MbC2, MbC3, McA, McB2, McC2, McC3, MkA, MkB2, MkC2, MkC3, MmD, MmD3, MmE).	Poor	Poor	Moderate
(MoA, MoB2, MoC2, MoC3)	Poor	Poor	Moderate

See footnotes at end of table.

engineering properties of the soils

Corrosion potential on pipes		Depth from surface	Suitability as source of—			
Steel	Concrete		Topsoil[2]	Sand	Gravel	Road fill
		Inches				
High	High	0–12	Good[3]	Not suitable	Not suitable	Not suitable.
		12–50	Not suitable	Not suitable	Not suitable	Not suitable.
High	High	0–15	Good	Not suitable	Not suitable	Not suitable.
		15–34	Not suitable	Not suitable	Not suitable	Poor.
		34–60	Not suitable	Fair	Not suitable	Fair.
High	High	0–37	Fair to good	Not suitable	Not suitable	Poor.
		37–50	Not suitable	Not suitable	Not suitable	Not suitable.
High	High	0–11	Poor	Not suitable	Not suitable	Not suitable.
		11–44	Not suitable	Not suitable	Not suitable	Not suitable.
		44–60	Not suitable	Not suitable	Not suitable	Poor.
Moderate	Moderate	0–10	Good	Not suitable	Not suitable	Not suitable.
		10–49	Not suitable	Not suitable	Not suitable	Fair.
		49–60	Not suitable	Not suitable	Not suitable	Fair.
High	High	0–60	Not suitable	Good	Not suitable	Poor.
Low	High	0–18	Fair	Poor	Not suitable	Poor.
		18–32	Not suitable	Not suitable	Not suitable	Good.
		32–42	Not suitable	Fair	Not suitable	Fair.
		42–60	Not suitable	Good	Not suitable	Poor.
High	High	0–7	Poor to fair	Not suitable	Not suitable	Not suitable.
		7–60	Not suitable	Not suitable	Not suitable	Poor.
High	High	0–16	Fair to good	Not suitable	Not suitable	Not suitable.
		16–35	Not suitable	Not suitable	Not suitable	Good.
		35–50+	Not suitable	Good	Fair	Fair.
Low	High	0–39	Fair	Good	Not suitable	Poor.
		39–55	Not suitable	Good	Not suitable	Poor.
		55–60	Not suitable	Not suitable	Not suitable	Good.
Low	High	0–39	Fair	Good	Not suitable	Poor.
		39–72	Not suitable	Good	Not suitable	Poor.
High	High	0–30	Good[3]	Not suitable	Not suitable	Not suitable.
		30–41	Not suitable	Fair	Not suitable	Poor.
		41–50	Not suitable	Not suitable	Not suitable	Fair.
High	High	0–9	Fair	Not suitable	Not suitable	Not suitable.
		9–35	Not suitable	Not suitable	Not suitable	Poor.
		35–55	Not suitable	Not suitable	Not suitable	Poor.
Low	High	0–39	Fair	Fair	Not suitable	Poor.
		39–47	Not suitable	Good	Not suitable	Poor.
		47–55	Not suitable	Not suitable	Not suitable	Good.
Low	High	0–33	Fair	Good	Not suitable	Poor.
		33–58	Not suitable	Good	Not suitable	Poor.
		58–66	Not suitable	Not suitable	Not suitable	Good.
Low	High	0–33	Fair	Good	Not suitable	Poor.
		33–72	Not suitable	Good	Not suitable	Poor.
Low	Moderate	0–11	Good	Not suitable	Not suitable	Not suitable.
		11–32	Not suitable	Not suitable	Not suitable	Fair.
		32–37	Not suitable	Not suitable	Not suitable	Good.
		37–50	Not suitable	Fair	Not suitable	Good.
Low	Moderate	0–16	Good	Not suitable	Not suitable	Not suitable.
		16–55	Not suitable	Not suitable	Not suitable	Fair.
		55–72	Not suitable	Not suitable	Not suitable	Fair.

TABLE 11.—*Interpretations of engineering*

Soil series and map symbols [1]	Suitability for earthwork when soil is— Wet	Suitability for earthwork when soil is— Frozen	Susceptibility to frost action
Mattapex (MpA, MpB2, MsA, MsB2, MsC2, MsC3, MtA, MtB2, MtC2, MtC3, MxD, MxD3, MxE).	Poor	Poor	Severe
Othello (BoA, BoB2, ObA, ObB2, OeC2)	Poor	Poor	Severe
Plummer (Pd)	Good	Fair	Severe
Pocomoke (Pk, Pm)	Poor	Not suitable	Severe
Portsmouth (Po)	Poor	Not suitable	Severe
Sassafras (SaA, SaB2, SaC2, SaC3, SaD2, SaD3, SaE, SfA, SfB2, SfC2, SfC3, SfD2, SfD3, SfE, SfE3, SfF).	Fair	Fair	Moderate
Woodstown (WdA, WdB2, WoA, WoB2, WoC2, WoD, WoE)	Fair	Poor	Severe

[1] Mapping units not listed in this table are Gravel and borrow pits (Gr), Made land (Ma), Mixed alluvial land (My), Swamp (Sw), and Tidal marsh (Tm).

[2] Rating for topsoil is given for the surface layer only, or to an average depth of 10 inches, whichever is less. All severely eroded areas are unsuitable as a source of topsoil.

The choice of a soil for building roads or highways is affected primarily by soil texture; by the height of the water table and its fluctuations; by the hazard of flooding; by the stability of the soil materials, particularly under heavy load or pressure; and by the expected severity of frost action.

The choice of a soil for a pond or a reservoir depends largely on the amount or rate of seepage that can be expected, particularly at the bottom of the reservoir. The amount of seepage depends on whether the reservoir floor consists of subsoil material or substratum material, for these layers may differ greatly in seepage characteristics. The most nearly ideal soil material for a reservoir floor is one that has slow seepage and has a high water table. Also desirable is a constant and reliable source of water from the ground water, from impounded runoff, or from a stream. Such a source is especially necessary if seepage or other losses are rapid.

Stability, erodibility, and the probable maximum density of soil material strongly affect the choice of a soil for building dikes, levees, dams, or other embankments. The maximum density to which soil material can be compacted in a dam or fill particularly affects the strength of the dam and the permeability, or the rate, at which water passes through it. All earth dams allow some seepage, but in most places it is desirable to keep such seepage to a minimum. Generally, soils that can be compacted to the highest maximum dry density, in pounds per cubic foot, have not only the least seepage losses but also the greatest stability. Soils in which the greatest maximum density can be obtained when compacted by ordinary methods are those that contain well-graded sands of various sizes and sufficient fine material to fill all voids between sand grains. A well-graded soil is one that has particles well distributed over a wide range in size or diameter. Such a soil can be easily increased in density and bearing properties by compaction.

The ease or difficulty with which a soil can be drained artificially is determined mainly by the permeability of the least permeable layer, which normally is the subsoil; by the height and fluctuation of the water table; and by the erodibility of the bottom and banks of ditches and canals.

Features that affect the kind and design of an irrigation system are the rate that applied water infiltrates the soil, the capacity of the soil to retain moisture, and the degree of natural drainage. Soils that have impeded drainage should be thoroughly drained before the irrigation system is installed.

The stability and erodibility of the surface layer of a soil are of special concern in planning and designing terraces and diversions. These features, as well as the water-holding capacity and the natural fertility of the surface soil, strongly influence the design of waterways through fields and the kinds of grasses or other vegetation needed for sodding the waterways.

Two types of small ponds are common in this county—

properties of the soils—Continued

Corrosion potential on pipes: Steel	Corrosion potential on pipes: Concrete	Depth from surface	Suitability as source of—: Topsoil [2]	Sand	Gravel	Road fill
High	High	0–15	Good	Not suitable	Not suitable	Not suitable.
		15–36	Not suitable	Not suitable	Not suitable	Fair.
		36–50	Not suitable	Fair	Not suitable	Good.
High	High	0–9	Fair	Not suitable	Not suitable	Not suitable.
		9–29	Not suitable	Not suitable	Not suitable	Poor.
		29–34	Not suitable	Fair	Not suitable	Fair.
		34–48	Not suitable	Fair	Not suitable	Poor.
High	High	0–28	Poor	Fair	Not suitable	Poor.
		28–46	Not suitable	Good	Not suitable	Poor.
		46–60	Not suitable	Not suitable	Not suitable	Fair to good.
High	High	0–14	Good [3]	Not suitable	Not suitable	Not suitable.
		14–26	Not suitable	Not suitable	Not suitable	Good.
		26–53	Not suitable	Good	Not suitable	Poor.
High	High	0–11	Good [3]	Not suitable	Not suitable	Not suitable.
		11–37	Not suitable	Not suitable	Not suitable	Poor.
		37–48	Not suitable	Fair	Not suitable	Poor.
Low	High	0–14	Good	Not suitable	Not suitable	Not suitable.
		14–43	Not suitable	Not suitable	Not suitable	Good.
		43–50	Not suitable	Fair	Not suitable	Fair.
Moderate	High	0–13	Good	Not suitable	Not suitable	Not suitable.
		13–34	Not suitable	Not suitable	Not suitable	Good.
		34–48	Not suitable	Fair	Not suitable	Fair.

[3] Surface layer contains a large or very large amount of organic matter. Rating applies only where such topsoil is desirable.

the excavated and the impounded. An excavated pond is one that is dug out of the natural terrain. The Bayboro soils are suitable for excavated small ponds under almost all conditions, for they have a high water table and are subject to only small loss through seepage because their subsoil and substratum are fine textured and clayey. The Portsmouth and other soils also have a naturally high water table and a subsoil that has slow seepage. But if all or most of the subsoil is removed from these soils for a pond and the sandy substratum is penetrated, severe seepage can be expected in periods when the water table falls.

On soils that do not have a high water table, water for ponds normally is impounded by constructing a small dam across a drainageway. Some soils in the county are suited to either excavated or impounded ponds, and others are suited to a combination of the two types. Figure 20 shows a small impounded pond.

The interpretations in tables 10, 11, and 12 are general, but they point out what the engineer can expect to find in any area of a soil that is shown on the detailed soil map. However, the interpretations do not give exact soil properties and evaluations at the precise point where an engineering project may be planned.

Soil test data

Table 13 shows test data for soil samples taken from fourteen profiles representing soils of five different series. The tests were performed by the Bureau of Public Roads. The table shows the depth to which each profile was sampled and, for each sample, the standard horizon designation, the mechanical analysis, the liquid limit, and the plasticity index. In the last two columns of the table are the classifications of the samples both for the AASHO and the Unified systems.

Figure 20.—Small impounded pond.

TABLE 12.—*Soil characteristics*

Soil series and map symbols [1]	Features that affect suitability of the soils for—			
	Pipelines	Roads or highways	Ponds or reservoirs	Dikes, levees, and embankments [2]
Bayboro (Ba)	0–2 feet to water table; very poor stability; subject to ponding.	High water table; very poor stability; severe frost action.	Very slow seepage	Very poor stability; highly erodible; low maximum density.
Bertie (BoA, BoB2)	1–4 feet to water table; poor stability.	Water table; poor stability; severe frost action.	Slow seepage in subsoil; moderate seepage in substratum.	Poor stability; highly erodible; medium to high maximum density.
Bibb (Bp)	0–3 feet to water table, poor stability.	Water table; flood hazard; poor stability; severe frost action.	Moderate seepage in subsoil; very slow seepage in substratum; constant water source.	Poor stability; moderately erodible; medium to low maximum density.
Bladen (Bt)	0–3 feet to water table; very poor stability.	Water table; very poor stability; severe frost action.	Very slow seepage	Very poor stability; moderately erodible; low maximum density.
Butlertown (BuA, BuB2, BuC2, BuC3).	2–5+ feet to water table; fair stability.	Water table; fair stability; severe frost action.	Slow seepage in subsoil; moderate seepage in substratum.	Fair stability; highly erodible; medium maximum density.
Coastal beaches (Cb)	Fluctuating, saline water table; loose; poor stability.	Water table; tidal hazard; loose; poor stability.	Excessive seepage	Poor stability; easily wind eroded; medium maximum density; highly porous.
Downer (DoA, DoB, DoC, DoC3, DoD, DoD3, DoE).	8+ feet to water table; fair stability.	Fair stability; slight frost action.	Moderate subsoil seepage; excessive substratum seepage.	Fair stability; high to low maximum density.
Elkton (Ek, EnA, EnB2, OeC2).	0–3 feet to water table; poor stability.	Water table; poor stability; severe frost action.	Low to very low seepage.	Poor stability; highly erodible; low maximum density.
Fallsington (FaA, FaB, FdA, FdB).	0–3 feet to water table; fair to good stability.	Water table; fair to good stability; severe frost action.	Moderate subsoil seepage; high substratum seepage.	Fair to good stability; moderately erodible; high to medium maximum density.
Galestown (GaB, GaC, GcB, GkD, GkE, GlC).	8+feet to water table; fair stability.	Fair stability; no or slight frost action.	High to excessive seepage.	Fair stability; easily wind eroded; medium to low maximum density; loose.
Johnston (Jo)	0–2 feet to water table; poor stability.	Water table; flood hazard; poor stability; severe frost action.	Moderate seepage; constant water source.	Poor stability; moderately erodible; medium maximum density.
Keyport (KeA, KeB2, KpA, KpB2, KrC3, KrD3).	2–4+ feet to water table; fair stability.	Water table; fair stability; severe frost action.	Low to very low seepage.	Fair stability; highly erodible; low maximum density.
Klej (KsA, KsB)	2–4+ feet to water table; fair stability.	Water table; fair stability; moderate frost action.	High seepage	Fair stability; medium to low maximum density.
Lakeland (LaB, LaC, GkD, GkE, GlC).	8+ feet to water table; fair stability.	Fair stability; no or slight frost action.	Rapid to excessive seepage.	Fair stability; easily wind eroded; medium to low maximum density.
Matapeake:				
(MbA, MbB2, MbC2, MbC3, McA, McB2, McC2, McC3, MkA, MkB2, MkC2, MkC3, MmD, MmD3, MmE).	5+ feet to water table; fair stability.	Fair stability; moderate frost action.	Moderate seepage	Fair stability; moderately erodible; medium to high maximum density.
(MoA, MoB2, MoC2, MoC3).	8+ feet to water table; fair stability.	Fair stability; moderate frost action.	Moderate seepage	Fair stability; highly erodible; medium maximum density.
Mattapex (MpA, MpB2, MsA, MsB2, MsC2, MsC3, MtA, MtB2, MtC2, MtC3, MxD, MxD3, MxE).	2–4+ feet to water table; fair stability.	Water table; fair stability; severe frost action.	Moderate seepage in subsoil; rapid seepage in substratum.	Fair stability; highly erodible; medium to high maximum density.
Othello (BoA, BoB2, ObA, ObB2, OeC2).	0–3 feet to water table; poor stability.	Water table; poor stability; severe frost action.	Slow seepage in subsoil; rapid seepage in substratum.	Poor stability; moderately erodible; medium to high maximum density.

See footnotes at end of table.

that affect engineering practices

Features that affect suitability of the soils for—Continued				Suitable type of pond
Drainage systems	Irrigation	Terraces or diversions	Waterways [3]	
Slowly permeable; highly erodible.	High moisture capacity; very slow infiltration; very poor drainage.	Highly erodible; very poor stability.	High moisture capacity; moderate fertility.	Excavated or impounded.
Moderately slowly permeable; highly erodible.	High moisture capacity; slow infiltration; somewhat poor drainage.	Highly erodible; poor stability.	High moisture capacity; moderate fertility.	Excavated or impounded.[4]
Slowly permeable; moderately erodible.	High moisture capacity; moderate infiltration; poor drainage.	Moderately erodible; poor stability.	High moisture capacity; low fertility.	Impounded and excavated.
Slowly permeable; moderately erodible.	High moisture capacity; very slow infiltration; poor drainage.	Moderately erodible; very poor stability.	High moisture capacity; low fertility.	Excavated and impounded.
Slowly permeable; highly erodible.	High moisture capacity; slow infiltration; impeded drainage.	Highly erodible; fair stability.	High moisture capacity; moderate fertility.	Impounded.
Not needed	Extremely low moisture capacity; extremely rapid infiltration.	Easily wind eroded; poor stability.	Extremely low moisture capacity and fertility.	Tidal water developments only.
Not needed	Low moisture capacity; rapid infiltration.	Fair stability	Low moisture capacity; low fertility.	Impounded.[5]
Slowly permeable; highly erodible.	High moisture capacity; slow infiltration; poor drainage.	Highly erodible; poor stability.	High moisture capacity; low fertility.	Excavated or impounded.
Moderately permeable; moderately erodible.	Moderate moisture capacity; moderate infiltration; poor drainage.	Moderately erodible; fair to good stability.	Moderate moisture capacity; low fertility.	Excavated and impounded.[4]
Not needed	Very low moisture capacity; rapid infiltration.	Easily wind eroded; fair stability.	Very low moisture capacity; low fertility.	Impounded.[5]
Moderately permeable; moderately erodible.	High moisture capacity; moderate infiltration; very poor drainage.	Moderately erodible; poor stability.	High moisture capacity; moderate fertility.	Impounded and excavated.
Slowly permeable; highly erodible.	High moisture capacity; slow infiltration; impeded drainage.	Highly erodible; fair stability.	High moisture capacity; low fertility.	Impounded and excavated.
Moderately rapidly permeable	Low moisture capacity; rapid infiltration; impeded drainage.	Fair stability	Low moisture capacity; low fertility.	Excavated and impounded.[4]
Not needed	Very low moisture capacity; rapid infiltration.	Easily wind eroded; fair stability.	Very low moisture capacity; low fertility.	Impounded.[5]
Not needed	High moisture capacity; moderate infiltration.	Moderately erodible; fair stability.	High moisture capacity; moderate fertility.	Impounded.
Not needed	Very high moisture capacity; moderate infiltration.	Highly erodible; fair stability.	Very high moisture capacity; moderate fertility.	Impounded.
Moderately slowly permeable; highly erodible.	High moisture capacity; moderate infiltration; mpeded drainage.	Highly erodible; fair stability.	High moisture capacity; moderate fertility.	Impounded and excavated.[4]
Moderately slowly permeable; moderately erodible.	High moisture capacity; moderate infiltration; poor drainage.	Moderately erodible; poor stability.	High moisture capacity; moderate fertility.	Excavated and impounded.

TABLE 12.—*Soil characteristics that affect*

Soil series and map symbols [1]	Features that affect suitability of the soils for—			
	Pipelines	Roads or highways	Ponds or reservoirs	Dikes, levees, and embankments [2]
Plummer (Pd)	0–3 feet to water table; poor stability.	Water table; poor stability; severe frost action.	Rapid to very rapid seepage.	Poor stability; medium to low maximum density.
Pocomoke (Pk, Pm)	0–3 feet to water table; poor stability; subject to ponding.	Water table; fair stability; severe frost action.	Moderate seepage in subsoil; rapid seepage in substratum.	Fair stability; moderately erodible; high to medium maximum density.
Portsmouth (Po)	0–3 feet to water table; poor stability; subject to ponding.	Water table; poor stability; severe frost action.	Slow seepage in subsoil; rapid seepage in substratum.	Poor stability; moderately erodible; high to medium maximum density.
Sassafras (SaA, SaB2, SaC2, SaC3, SaD2, SaD3, SaE, SfA, SfB2, SfC2, SfC3, SfD2, SfD3, SfE, SfE3, SfF).	8+ feet to water table; good stability.	Good stability; moderate frost action.	Moderate seepage in subsoil; rapid seepage in substratum.	Good stability; moderately erodible; high to medium maximum density.
Woodstown (WdA, WdB2, WoA, WoB2, WoC2, WoD, WoE).	2–4+ feet to water table; good stability.	Water table; good stability; severe frost action.	Moderate seepage	Good stability; moderately erodible; high to medium maximum density.

[1] Not listed in this table are Gravel and borrow pits, Made land, Mixed alluvial land, Swamp, and Tidal marsh.
[2] Where two ratings are given for maximum density, the first applies to the subsoil and the second to the substratum; otherwise the rating applies to both. It is assumed that if the surface layer contains appreciable organic matter, the soil will not be used for dikes, levees, and embankments.
[3] Features listed are for surface layer only.

The test to determine liquid limit and plastic limit measures the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the material passes from a semisolid to a plastic state. The liquid limit is the moisture content at which the material passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which soil material is in a plastic condition.

Drainage groups of soils

In this subsection the soils of the county that require artificial drainage are grouped according to similarity in drainage requirements. As a rule, all the soils in a particular group have similar characteristics and about the same kind of drainage problems. Each group differs from the others mainly in the kind and intensity of the drainage practices required. Table 14 lists the soils in 16 drainage groups; describes the major drainage problems for each group; and, according to slope, indicates the best kind of drainage system to use. The information in this table was taken from "Drainage Guide for Maryland, Coastal Plain" (*11*).

Table 14 is not intended as a technical guide to solving all the drainage problems in the county. It does, however, show the farmer and the drainage engineer the kinds of problems to be expected and the kinds of practices needed on soils that require drainage. For a particular field, farm, or other area, the details of a proposed drainage system should be worked out on the site.

Some areas that are nearly level and sloping can be drained by using open ditches in the nearly level places and diversions on the stronger slopes. For other areas, open field drains or V-type ditches may be suitable and bedding may be desirable, especially between V-type ditches. Bedding consists of plowing or otherwise ele-

***Figure 21.*—Laying tile by machine in a field near Church Hill. Target pole on the left is one of several in a row used as a guide in setting the tile line.**

engineering practices—Continued

Features that affect suitability of the soils for—Continued				Suitable type of pond
Drainage systems	Irrigation	Terraces or diversions	Waterways [3]	
Moderately rapidly or rapidly permeable.	Very low moisture capacity; rapid infiltration; poor drainage.	Poor stability	Very low moisture capacity; very low fertility.	Excavated.
Moderately permeable; moderately erodible.	Moderate moisture capacity; moderate infiltration; poor drainage.	Moderately erodible; fair stability.	Moderate moisture capacity; moderate fertility.	Excavated and impounded.[4]
Moderately slowly permeable; moderately erodible.	Moderate moisture capacity; slow infiltration; poor drainage.	Moderately erodible; poor stability.	Moderate moisture capacity; moderate fertility.	Excavated and impounded.[4]
Not needed	Moderate moisture capacity; moderate infiltration.	Moderately erodible; good stability.	Moderate moisture capacity; moderate fertility.	Impounded.[5]
Moderately permeable; moderately erodible.	Moderate moisture capacity; moderate infiltration.	Moderately erodible; good stability.	Moderate moisture capacity; moderate fertility.	Excavated and impounded.

[4] Excavated ponds on these soils generally hold water only to the level of the natural water table, which fluctuates and is low during long dry periods. The water can be kept at a higher level by using impoundments wherever feasible, but such impounded ponds may need sealing to maintain the desired level, particularly if the pond is dug into porous substratum materials.

[5] Ponds on these soils almost invariably need artificial treatment that seals them against excessive water losses. Sealing may also be needed on other soils in the county if local conditions require it.

vating the soil into beds between the drains or ditches. Some areas can be drained by using a random system of tiling, that is, one in which the tile is laid in natural watercourses and extra branch lines are laid in other wet areas as needed. In other areas, where the soils are too wet for random tiling, a complete system of tile drainage is needed, and the tile is laid in a definite pattern throughout the wet area (fig. 21). Choosing the kind of drainage system to use depends partly on cost. Draining some soils is too costly to be justified.

In areas to be drained by ditching, the kind and depth of soil and the characteristics of the underlying material must be considered. The Plummer, Fallsington (fig. 22), Pocomoke, and other fairly shallow soils underlain by loose sand are not well suited to ditches. Water loosens the sand and causes it to scour the ditches in some places and to clog them in others. In the Elkton (fig. 23), Bayboro, and other deep, coherent soils, ditching is more suitable because the ditches are less readily clogged and are more easily maintained.

In cultivated areas a network of small lateral ditches can be used to remove excess water. From the lateral ditches, water flows into larger ditches and then into a natural drainageway or a canal. The number of lateral ditches needed depends partly on soil texture, the degree of wetness, and the kind of crop to be grown, but mainly on permeability of the plow layer and the subsoil. For example, draining the Woodstown soils generally takes only a few widely spaced lateral ditches, but draining the Elkton soils requires laterals that are much more closely spaced.

Many farmers "land" the soils by using a plow or other tool to build a low ridge midway between lateral ditches. The sides of the ridge slope gradually toward the adjacent ditch. This practice is especially effective in areas of very wet soils, such as the Bayboro, Bibb, Elkton, Fallsington, Johnston, Othello, Plummer, Pocomoke, and Portsmouth soils.

In areas where tile drainage is used, the characteristics of the soil and the gradient of the slope largely determine

***Figure 22.*—A main field ditch that is used as an outlet for lateral tile lines draining an area of Fallsington sandy loam, 0 to 2 percent slopes. Sand is sloughing from the banks and starting to choke up the ditch.**

TABLE 13.—*Engineering test data for soil*

[Tests performed by Bureau of Public Roads (BPR) in accordance with standard

Soil name and location	BPR report number	Depth	Horizon	Mechanical analyses [1]		
				Percentage passing sieve—		
				¾-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)
		Inches				
Bayboro silt loam, modal: 1½ miles north of Templeville and east of Bear Pond Road.	S-38880	0–12	A1	----------	----------	100
	S-38881	17–33	B2tg	----------	----------	----------
	S-38882	33–50	Cg	----------	----------	100
Bayboro silt loam, sandy C variant: 1½ miles north of Templeville on Bear Pond Road.	S-38883	0–13	A1	----------	----------	100
	S-38885	20–32	B2tg	----------	----------	100
	S-38884	32–45	Cg	----------	----------	100
Butlertown silt loam, modal: 1¾ miles north-northeast of Wye Mills.	S-38886	0–10	Ap	----------	----------	100
	S-38887	16–34	B2t	----------	----------	100
	S-38888	34–49	Bx	----------	----------	100
Butlertown silt loam, sandy C variant: One-eighth mile southwest of U.S. Highway No. 50 on Carmichael Road.	S-38889	0–10	Ap	----------	----------	100
	S-38890	16–32	B2t	----------	----------	100
	S-38891	32–48	Bx	----------	----------	100
Butlertown silt loam, light variant: 2½ miles east of Centreville.	S-39194	18–32	B2t	----------	----------	100
	S-39195	32–47	Bx	----------	----------	100
	S-39196	47–60	C	----------	----------	100
Matapeake silt loam, silty substratum, modal: 150 yards south of Bloomingdale Road, 1¼ miles east of U.S. Highway No. 50.	S-39197	0–11	Ap	----------	----------	100
	S-39198	26–43	B22t	----------	----------	100
	S-39199	43–55	B23	----------	----------	100
Matapeake silt loam, silty substratum, thin solum variant: On U.S. Highway No. 213, one-fourth mile south of U.S. Highway No. 301.	S-39203	0–10	Ap	----------	----------	100
	S-39204	22–35	B22t	----------	----------	----------
	S-39205	35–50	C	----------	----------	----------
Matapeake silt loam, silty substratum, sandy C variant: On U.S. Highway No. 213, one-eighth mile north of U.S. Highway No. 301.	S-39200	0–9	Ap	----------	----------	100
	S-39201	26–43	B22t	----------	----------	100
	S-39202	43–50	C	----------	----------	100
Sassafras sandy loam, modal: 75 feet south of DeCoursey Road, one-fourth mile southwest of Wye Island Road.	S-38892	2–14	A2	----------	----------	100
	S-38893	20–31	B21t	----------	----------	100
	S-38894	31–43	B22t	----------	----------	100
	S-38895	43–50	C	----------	----------	100
Sassafras sandy loam, brittle C variant: 1 mile southwest of Church Hill.	S-39206	8–16	A2	----------	----------	100
	S-39207	20–35	B2t	----------	----------	100
	S-39208	35–42	Cx	----------	----------	100
Sassafras sandy loam, porous subsoil variant (Greenwich): 2 miles east of Kingstown, on Roundtop Road.	S-39209	0–10	Ap	[4] 98	96	95
	S-39210	20–32	B22t	100	99	99
	S-39211	32–48	C	----------	----------	100
Woodstown sandy loam, modal: One-half mile west of McGinnes on McGinnes Road.	S-39212	13–21	B21t	----------	----------	100
	S-39213	21–34	B22t	----------	----------	100
	S-39214	34–48	Cg	100	98	96

See footnotes at end of table.

samples taken from fourteen soil profiles

procedures of the American Association of State Highway Officials (AASHO) (*1*)]

Mechanical analyses [1]—Continued						Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Continued		Percentage smaller than—						AASHO	Unified [2]
No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
99	97	96	74	41	27	59	13	A–7–5(13)	MH or OH.
----------	100	98	77	44	34	43	18	A–7–6(12)	ML–CL.
99	97	95	70	37	29	41	16	A–7–6(11)	ML–CL.
97	90	88	62	32	20	76	12	A–7–5(13)	MH or OH.
98	95	93	68	32	25	34	12	A–6(9)	ML–CL.
91	68	65	45	21	16	24	6	A–4(7)	ML–CL.
98	92	90	61	24	14	30	7	A–4(8)	ML–CL.
99	96	94	66	33	25	33	11	A–6(8)	ML–CL.
99	95	93	60	27	19	32	9	A–4(8)	ML–CL.
96	88	85	55	22	14	30	6	A–4 (8)	ML–CL.
99	96	93	66	34	25	38	14	A–6 (10)	ML–CL.
96	85	83	62	32	22	31	10	A–4 (8)	ML–CL.
99	93	90	63	33	27	39	16	A–6 (10)	CL.
97	85	83	62	32	23	32	10	A–4 (8)	ML–CL.
95	71	69	52	27	20	27	9	A–4 (7)	CL.
99	93	90	61	27	17	29	6	A–4 (8)	ML–CL.
99	96	94	67	33	26	36	13	A–6 (9)	ML–CL.
99	96	94	62	29	23	33	11	A–6 (8)	ML–CL.
99	94	91	62	25	16	31	6	A–4 (8)	ML.
100	98	95	68	33	28	37	14	A–6 (10)	ML–CL.
100	97	94	63	28	22	30	8	A–4 (8)	ML–CL.
97	80	78	55	24	17	25	6	A–4(8)	ML–CL.
97	77	75	57	28	20	28	9	A–4(8)	CL.
93	49	46	37	20	14	19	6	A–4(3)	SM–SC.
81	55	53	37	16	9	20	4	A–4(4)	ML–CL.
84	63	61	48	29	24	36	17	A–6(8)	CL.
82	59	56	44	25	20	31	12	A–6(6)	CL.
64	13	13	12	10	6	[3] NP	[3] NP	A–2–4(0)	SM.
78	53	51	37	19	13	21	5	A–4(4)	ML–CL.
82	63	61	48	26	21	31	13	A–6(7)	CL.
80	49	47	34	16	12	22	7	A–4(3)	SM–SC.
75	30	29	23	14	10	18	4	A–2–4(0)	SM–SC.
64	30	30	29	27	26	47	23	A–2–7(2)	SC.
70	14	14	12	7	6	[3] NP	[3] NP	A–2–4(0)	SM.
94	73	71	53	29	23	30	10	A–4(8)	CL.
98	75	69	46	26	22	30	9	A–4(8)	ML–CL.
75	38	35	27	18	15	24	7	A–4(1)	SM–SC.

TABLE 13.—*Engineering test data for soil samples*

Soil name and location	BPR report number	Depth	Horizon	Mechanical analyses [1]		
				Percentage passing sieve—		
				¾-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)
		Inches				
Woodstown sandy loam, heavy variant: One-eighth mile southwest of Wye Island Road on north side of DeCoursey Road.	S-38898	2-12	A2	--------	------------	100
	S-38899	12-23	B21t	--------	------------	100
	S-38900	23-35	B22t	--------	------------	100
Woodstown sandy loam, sandy variant: One-fourth mile south of Perrey Church on Piney Neck Road.	S-38896	3-12	A2	--------	------------	100
	S-38897	19-28	B22t	--------	------------	100

[1] Mechanical analyses according to the AASHO Designation T 88-57. Results by this procedure frequently differ from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis

TABLE 14.—*Drainage soil groups and suggested kinds of drainage systems*

Soil group and included soils	Major problems	Slope range	Kind of drain	Remarks
		Percent		
Drainage group 2A: Moderately well drained, medium-textured soils that have a moderately fine textured subsoil and a sandy or silty substratum. (BuA) Butlertown silt loam, 0 to 2 percent slopes. (BuB2) Butlertown silt loam, 2 to 5 percent slopes, moderately eroded. (MpA) Mattapex fine sandy loam, 0 to 2 percent slopes. (MpB2) Mattapex fine sandy loam, 2 to 5 percent slopes, moderately eroded. (MsA) Mattapex loam, 0 to 2 percent slopes. (MsB2) Mattapex loam, 2 to 5 percent slopes, moderately eroded. (MtA) Mattapex silt loam, 0 to 2 percent slopes. (MtB2) Mattapex silt loam, 2 to 5 percent slopes, moderately eroded. (WdA) Woodstown loam, 0 to 2 percent slopes. (WdB2) Woodstown loam, 2 to 5 percent slopes, moderately eroded.	Seasonally high water table for brief periods and impeded drainage in the lower subsoil.	0 to 2 2 to 5	Tile in a random or a patterned system; open ditches. Tile in a random or a patterned system; diversions.	Land smoothing may be necessary. Reduce spacing between diversions and add waterways where necessary for control of erosion; use diversions for interceptors where needed.
Drainage group 2B: Moderately well drained, moderately coarse textured soils that have a moderately fine textured subsoil and a sandy substratum. (WoA) Woodstown sandy loam, 0 to 2 percent slopes. (WoB2) Woodstown sandy loam, 2 to 5 percent slopes, moderately eroded.	Seasonally high water table for brief periods and impeded drainage in the lower subsoil.	0 to 2 2 to 5	Tile in a random or a patterned system; open ditches. Tile in a random or a patterned system; diversions.	Land smoothing may be necessary. Boundary drainage may be practical; spacing of diversions and width of strips may be reduced if necessary to control erosion.

taken from fourteen soil profiles—Continued

Mechanical analyses [1]—Continued						Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Continued		Percentage smaller than—						AASHO	Unified [2]
No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
89	66	64	43	20	12	20	2	A-4(6)	ML.
90	71	69	52	27	21	32	12	A-6(8)	CL.
88	64	62	44	20	15	26	8	A-4(6)	CL.
98	50	45	31	14	9	[3] NP	[3] NP	A-4(3)	SM.
97	41	35	26	15	11	[3] NP	[3] NP	A-4(1)	SM.

data used in this table are not suitable for naming textural classes for soils.

[2] SCS and BPR have agreed to consider that all soils having plasticity indexes within two points of the A-line are to be given a borderline classification. Examples of borderline classifications obtained by this use are ML-CL and SM-SC.

[3] NP=Nonplastic.

[4] 100 percent of the material of this horizon passed a 1½-inch sieve.

TABLE 14.—*Drainage soil groups and suggested kinds of drainage systems*—Continued

Soil group and included soils	Major problems	Slope range	Kind of drain	Remarks
		Percent		
Drainage group 4: Moderately well drained, coarse-textured soils that have a subsoil of sand or loamy sand. (KsA) Klej loamy sand, 0 to 2 percent slopes. (KsB) Klej loamy sand, 2 to 5 percent slopes.	Level, depressional, or sloping soils that have a seasonally high water table for long periods.	0 to 2 2 to 5	Tile in a random system; interceptor ditches or interceptor tile. Tile in a random system; diversions.	Land smoothing may be necessary. Interceptor tile may be used with diversions; reduce spacing of diversions and width of strips if necessary to control erosion.
Drainage group 6-2A: Moderately well drained, medium-textured soils that have a subsoil and a substratum of clay. (KeA) Keyport loam, 0 to 2 percent slopes. (KeB2) Keyport loam, 2 to 5 percent slopes, moderately eroded. (KpA) Keyport silt loam, 0 to 2 percent slopes. (KpB2) Keyport silt loam, 2 to 5 percent slopes, moderately eroded.	Impeded subsoil drainage and a perched water table that is high for long periods.	0 to 2 2 to 5	Random ditches; field-ditch system. Diversions	Land smoothing may be necessary. Use graded rows and sodded waterways; these may be supplemented by a system of terraces where erosion is a problem.
Drainage group 7-A: Poorly drained, medium-textured soils that have a subsoil and a substratum of sandy clay loam. (FaA) Fallsington loam, 0 to 2 percent slopes. (FaB) Fallsington loam, 2 to 5 percent slopes.	Brief to long periods of high water table.	0 to 2 2 to 5	Field ditches Diversions and interceptor tile.	Used graded rows for crops. Tile may be used to intercept seepage from adjacent higher areas.
Drainage group 7-B: Poorly drained, moderately coarse textured soils that have a sandy clay loam subsoil and a sandy substratum. (FdA) Fallsington sandy loam, 0 to 2 percent slopes. (FdB) Fallsington sandy loam, 2 to 5 percent slopes.	Brief to long periods of high water table.	0 to 2 2 to 5	Field ditches; tile in a patterned system. Diversions and interceptor tile.	Used graded rows for crops. Tile may be used to intercept seepage from adjacent higher areas.

TABLE 14.—*Drainage soil groups and suggested kinds of drainage systems*—Continued

Soil group and included soils	Major problems	Slope range	Kind of drain	Remarks
		Percent		
Drainage group 8–1A: Poorly drained, medium-textured soils that have a silty clay loam subsoil and a sandy substratum.[1] (BoA) Bertie and Othello silt loams, 0 to 2 percent slopes. (BoB2) Bertie and Othello silt loams, 2 to 5 percent slopes, moderately eroded. (ObA) Othello silt loam, 0 to 2 percent slopes. (ObB2) Othello silt loam, 2 to 5 percent slopes, moderately eroded.	Long periods of high water table.	0 to 2	Field ditches	Use graded rows for crops; land smoothing may be necessary.
		2 to 5	Field ditches and diversions.	Use graded rows for crops; tile may be used to intercept seepage from adjacent higher areas.
Drainage group 8–2A: Poorly drained, moderately fine textured soil that has a fine textured, very slowly permeable subsoil. (Bt) Bladen silty clay loam.	Long periods of high water table.	0 to 2	Field ditches	Not generally used for crops; land smoothing may be necessary.
Drainage group 8–2B: Poorly drained, medium-textured soils that have a slowly permeable subsoil of fine silty clay loam. (Ek) Elkton loam. (EnA) Elkton silt loam, 0 to 2 percent slopes. (EnB2) Elkton silt loam, 2 to 5 percent slopes, moderately eroded.	Long periods of high water table.	0 to 2	Field ditches	Use graded rows for crops; land smoothing may be necessary.
		2 to 5	Field ditches and diversions.	Use graded rows for crops; tile is not suitable for interceptors.
Drainage group 9–1: Poorly drained, coarse-textured soil that has a subsoil of sand or loamy sand. (Pd) Plummer loamy sand.	Areas in depressions that have long periods of high to very high water table.	0 to 2	Tile in a patterned system; field ditches.	Some areas subject to overflow; possible over-drainage in dry seasons; ditches difficult to maintain.
Drainage group 9–3A: Very poorly drained, medium-textured soil that has a sandy clay loam subsoil and a sandy substratum. (Pk) Pocomoke loam.	Long to very long periods of high to very high water table.	0 to 2	Tile in a random system; field drains.	Bedding may be needed between open drains.
Drainage group 9–3B: Very poorly drained, moderately coarse textured soil that has a sandy clay loam subsoil and a sandy substratum. (Pm) Pocomoke sandy loam.	Long to very long periods of high to very high water table.	0 to 2	Tile in a random system; field drains.	Use wider spacing than in group 9–3A; bedding may be needed between open drains.
Drainage group 9–4A: Very poorly drained, medium-textured soil that has a silty clay loam subsoil and a sandy substratum. (Po) Portsmouth silt loam.	Long to very long periods of high to very high water table.	0 to 2	V-type ditches; field drains; bedding.	Bedding advisable for row crops.
Drainage group 9–6B: Very poorly drained, medium-textured soil that has a clay subsoil. (Ba) Bayboro silt loam.	Long to very long periods of high to very high water table.	0 to 2	V-type ditches; field drains.	Bedding advisable on high-row plantings between open drains.
Drainage group 11–A: Poorly drained and very poorly drained, medium-textured soils on flood plains. (Bp) Bibb silt loam. (Jo) Johnston loam.	Flooding; seepage from uplands, and long to very long periods of high to very high water table.	0 to 2	V-type ditches; field drains; tile interceptors.	Use tile interceptors to collect upland seepage; dikes and floodgates may be needed in some places.
Drainage group 12: Unclassified soil material on flood plains. (My) Mixed alluvial land.	Flooding and various other problems.	0 to 2	Any appropriate kind of drain.	Land not generally used for crops; dikes and floodgates may be desirable in some places.

[1] The Bertie soils in this group are only somewhat poorly drained, but they occur so closely with the Othello soils that the practices needed to provide adequate drainage for the Othello soils also drain the Bertie soils.

Figure 23.—**An area of Elkton silt loam, 0 to 2 percent slopes, ponded after a heavy rain. This area will be drained by installing a field ditch.**

the spacing of the tile. In moderately fine textured, slowly permeable soils, such as the Elkton, the tile lines must be laid closer together than in porous, sandy soils, such as the Klej and Plummer.

Irrigation groups of soils

In this subsection general practices of irrigation are discussed; the soils suitable for conservation irrigation are grouped; and the groups are described. Conservation irrigation is the application of water in amounts that maintain high yields but neither waste water nor damage crops or soils.

Rainfall in Queen Annes County is generally adequate for agriculture, but it is not always well distributed during the growing season. Extended dry periods frequently occur between June and September. As a result, many crops and pastures are damaged. If enough water is available, an irrigation system can maintain favorable yields during dry periods.

Conservation irrigation should be a part of a complete farm program of soil and water conservation (*3*). Because irrigation is expensive, it can be economically used only on soils that produce a large increase in yields if water is always adequate. These soils should be liberally fertilized and adequately limed. The cropping system should include crops that help control erosion, minimize leaching, maintain good tilth, and furnish organic matter.

To be suitable for irrigation, soils must have good drainage. Soils that are only moderately well drained to very poorly drained are suitable for irrigation only if an adequate drainage system is installed and maintained. Severely eroded soils are included in the drainage group if they are suitable for regular cultivation.

Irrigating a large area requires a large amount of water. Trying to irrigate with too little water is a common mistake. An ordinary farm pond, for example, supplies enough water to irrigate only a small home garden, not an extensive area.

Water for irrigation can be obtained from wells, streams, or reservoirs. A permit to drill an irrigation well or to construct a pond or a reservoir must be obtained from the State Department of Geology, Mines, and Water Resources, John Hopkins University, Baltimore, Md. This department also gives information about the supply of ground water in a specific area. Drilling a test well is a good way to determine whether the supply of water is adequate.

The only streams suitable as sources of irrigation water are those that have a continuous flow during extended droughts and that have not been contaminated by salt water or other pollutants. During a drought streamflow should be measured and the water tested to determine if enough water of suitable quality will be available for irrigation during dry periods. The storage capacity of a surface reservoir must be large enough to supply water needed by crops and to replace losses caused by seepage and evaporation. Generally, ½ to 1 acre-foot of stored water is needed during the irrigation season for each acre irrigated. A smaller reservoir—large enough to store water for only one application—can be used if it can be refilled between irrigations.

If the quality of water is questioned, samples should be sent to the State Soil Testing Laboratory, Agronomy Department, University of Maryland, College Park, Md. There, the water can be analyzed for acidity, salt content, or other characteristics that may harm a crop. Runoff water impounded in reservoirs may carry plant diseases that infect susceptible crops if it is used for irrigation. The red stele disease of strawberries, for example, can be transmitted in this way. Runoff water from areas in which strawberries have been grown should not be used to irrigate other fields of strawberries.

Laws and regulations govern the use of water taken from streams and wells. The landowner who plans to use water for irrigation from a channelized stream should obtain information regarding his rights and obligations before investing in irrigation equipment.

To be successful, irrigation must meet the needs of both crops and soils. Different crops need different amounts of water applied at different intervals. Some soils hold much water, and others hold little; some soils absorb water readily, and others absorb it more slowly.

In table 15 the soils of the county suitable for irrigation are placed in groups according to characteristics that affect irrigation. The numbers of the groups are not consecutive, because a statewide system is used, and only a few of the irrigation groups in Maryland are represented in Queen Annes County.

A few truck crops are listed separately in the table, but most truck crops are shown simply in truck-crop group 1, 2, or 3. Truck groups referred to in the table consist of the following:

Truck group 1	Truck group 2	Truck group 3
Very shallow rooted crops	*Shallow rooted crops*	*Moderately deep rooted crops*
Lettuce.	Beets.	Asparagus.
Onions.	Broccoli.	Eggplant.
Spinach.	Cabbage.	Lima beans.
Strawberries.	Cauliflower.	Melons.
	Celery.	Peppers.
	Cucumbers.	Pumpkins.
	Peas.	Squash.
	Snap beans.	

TABLE 15.—*Irrigation groups of soils, suitable crops, and certain water relationships*

Irrigation groups and soils	Suitable crops	Estimated maximum rate of application on nearly level land [1]	Estimated average depth to be irrigated	Estimated average available moisture to depth of irrigation [2]
		In. per hr.	*In.*	*In.*
Group 1: Poorly drained to somewhat excessively drained sands and loamy sands that are 36 or more inches deep. Galestown loamy sand, clayey substratum, 0 to 5 percent slopes. Galestown loamy sand, clayey substratum, 5 to 10 percent slopes. Galestown sand, clayey substratum, 0 to 5 percent slopes. Klej loamy sand, 0 to 2 percent slopes. [3] Klej loamy sand, 2 to 5 percent slopes. [3] Lakeland loamy sand, clayey substratum, 0 to 5 percent slopes. Lakeland loamy sand, clayey substratum, 5 to 10 percent slopes. Plummer loamy sand. [4]	Truck group 1	1. 0	18	1. 5
	Truck group 2	1. 0	24	2. 0
	Truck group 3	1. 0	30	2. 5
	Corn	1. 0	27	2. 3
	Sweet corn	1. 0	24	2. 0
	Soybeans	1. 0	24	2. 0
	Alfalfa	1. 0	36	3. 0
	Irish potatoes	1. 0	24	2. 0
	Sweetpotatoes	1. 0	24	2. 3
	Tomatoes	1. 0	27	2. 0
	Orchards with cover	1. 0	36	3. 0
	Orchards without cover	1. 0	36	3. 0
	Grass mixture	1. 0	24	2. 0
Group 3: Well-drained loamy sands to a depth of about 20 inches. The subsoil is finer textured than the surface layer, is 10 to 18 inches thick, and is underlain by sand. Downer loamy sand, 0 to 2 percent slopes Downer loamy sand, 2 to 5 percent slopes. Downer loamy sand, 5 to 10 percent slopes. Downer loamy sand, 5 to 10 percent slopes, severely eroded. Downer loamy sand, 10 to 15 percent slopes.	Truck group 1	. 9	18	1. 5
	Truck group 2	. 9	18	1. 5
	Truck group 3	. 9	18	1. 5
	Corn	. 9	27	2. 8
	Sweet corn	. 9	24	2. 5
	Soybeans	. 9	24	2. 5
	Alfalfa	1. 0	27	2. 8
	Irish potatoes	. 9	18	1. 5
	Sweetpotatoes	. 9	18	1. 5
	Tomatoes	. 9	27	2. 8
	Orchards with cover	1. 0	27	2. 8
	Orchards without cover	. 9	27	2. 8
	Grass mixture	1. 0	24	2. 5
Group 9: Moderately well drained and well drained sandy loams to a depth of about 10 inches. The subsoil is sandy clay loam or light silty clay loam and extends to a depth of 30 inches or more. Fallsington sandy loam, 0 to 2 percent slopes.[4] Fallsington sandy loam, 2 to 5 percent slopes.[4] Matapeake fine sandy loam, 0 to 2 percent slopes. Matapeake fine sandy loam, 2 to 5 percent slopes, moderately eroded. Matapeake fine sandy loam, 5 to 10 percent slopes, moderately eroded. Matapeake fine sandy loam, 5 to 10 percent slopes, severely eroded. Mattapex fine sandy loam, 0 to 2 percent slopes.[3] Mattapex fine sandy loam, 2 to 5 percent slopes, moderately eroded.[3] Pocomoke sandy loam.[5] Sassafras sandy loam, 0 to 2 percent slopes. Sassafras sandy loam, 2 to 5 percent slopes, moderately eroded. Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded. Sassafras sandy loam, 5 to 10 percent slopes, severely eroded. Sassafras sandy loam, 10 to 15 percent slopes, moderately eroded. Woodstown sandy loam, 0 to 2 percent slopes.[3] Woodstown sandy loam, 2 to 5 percent slopes, moderately eroded.[3] Woodstown sandy loam, 5 to 10 percent slopes, moderately eroded.[3] Woodstown sandy loam, 10 to 15 percent slopes.[3]	Truck group 1	. 6	12	1. 7
	Truck group 2	. 6	15	2. 2
	Truck group 3	. 6	18	2. 7
	Corn	. 6	24	3. 7
	Sweet corn	. 6	18	2. 7
	Soybeans	. 6	18	2. 7
	Alfalfa	1. 0	27	4. 2
	Irish potatoes	. 6	18	2. 7
	Sweetpotatoes	. 6	18	2. 7
	Tomatoes	. 6	24	3. 7
	Orchards with cover	1. 0	27	4. 2
	Orchards without cover	. 6	27	4. 2
	Grass mixture	1. 0	18	2. 7

See footnotes at end of table.

TABLE 15.—*Irrigation groups of soils, suitable crops, and certain water relationships*—Continued

Irrigation groups and soils	Suitable crops	Estimated maximum rate of application on nearly level land [1]	Estimated average depth to be irrigated	Estimated average available moisture to depth of irrigation [2]
		In. per hr.	*In.*	*In.*
Group 10: Poorly and very poorly drained loams and silt loams that are uniform in texture to a depth of 30 inches or more.	Truck group 1	0.5	12	2.0
Bibb silt loam.[4, 6]	Truck group 2	.5	15	2.5
Johnston loam.[4, 6]	Truck group 3	.5	18	3.0
	Corn	.5	24	4.0
	Sweet corn	.5	18	3.0
	Soybeans	.5	18	3.0
	Tomatoes	.5	24	4.0
	Grass mixture	.8	18	3.0
Group 12: Moderately well drained to very poorly drained loams and silt loams that have a slowly or very slowly permeable, clayey subsoil at a depth of about 10 inches.	Truck group 1	.3	12	2.0
Bayboro silt loam.[5]	Truck group 2	.3	15	2.5
Elkton loam.[4]	Truck group 3	.3	18	3.0
Elkton silt loam, 0 to 2 percent slopes.[4]	Corn	.3	18	3.0
Elkton silt loam, 2 to 5 percent slopes, moderately eroded.[4]	Sweet corn	.3	18	3.0
Keyport loam, 0 to 2 percent slopes.[3]	Soybeans	.3	18	3.0
Keyport loam, 2 to 5 percent slopes, moderately eroded.[3]	Tomatoes	.3	18	3.0
Keyport silt loam, 0 to 2 percent slopes.[3]	Grass mixture	.5	18	3.0
Keyport silt loam, 2 to 5 percent slopes, moderately eroded.[3]				
Portsmouth silt loam.[5]				
Group 13: Well-drained to poorly drained loams and silt loams to a depth of about 10 inches. The subsoil is sandy clay loam or silty clay loam and extends to a depth of 30 inches or more.	Truck group 1	.4	12	2.0
Bertie and Othello silt loams, 0 to 2 percent slopes.[7]	Truck group 2	.4	15	2.5
Berties and Othello silt loams, 2 to 5 percent slopes, moderately eroded.[7]	Truck group 3	.4	18	3.0
Butlertown silt loam, 0 to 2 percent slopes.[3]	Corn	.4	24	4.0
Butlertown silt loam, 2 to 5 percent clopes, moderately eroded.[3]	Sweet corn	.4	18	3.0
Butlertown silt loam, 5 to 10 percent slopes, moderately eroded.[3]	Soybeans	.4	18	3.0
Butlertown silt loam, 5 to 10 percent slopes, severely eroded.[3]	Alfalfa	.7	27	4.5
Fallsington loam, 0 to 2 percent slopes.[4]	Irish potatoes	.4	18	3.0
Fallsington loam, 2 to 5 percent slopes.[4]	Sweetpotatoes	.4	18	3.0
Matapeake loam, 0 to 2 percent slopes.	Tomatoes	.4	24	4.0
Matapeake loam, 2 to 5 percent slopes, moderately eroded.	Orchards with cover	.7	27	4.5
Matapeake loam, 5 to 10 percent slopes, moderately eroded.	Orchards without cover	.4	27	4.5
Matapeake loam, 5 to 10 percent slopes, severely eroded.	Grass mixture	.7	18	3.0
Matapeake silt loam, 0 to 2 percent slopes.				
Matapeake silt loam, 2 to 5 percent slopes, moderately eroded.				
Matapeake silt loam, 5 to 10 percent slopes, moderately eroded.				
Matapeake silt loam, 5 to 10 percent slopes, severely eroded.				
Matapeake soils, 10 to 15 percent slopes.				
Matapeake silt loam, silty substratum, 0 to 2 percent slopes.				
Matapeake silt loam, silty substratum, 2 to 5 percent slopes, moderately eroded.				
Matapeake silt loam, silty substratum, 5 to 10 percent slopes, moderately eroded.				
Matapeake silt loam, silty substratum, 5 to 10 percent slopes, severely eroded.				
Mattapex loam, 0 to 2 percent slopes.[3]				
Mattapex loam, 2 to 5 percent slopes, moderately eroded.[3]				
Mattapex loam, 5 to 10 percent slopes, moderately eroded.[3]				
Mattapex loam, 5 to 10 percent slopes, severely eroded.[3]				
Mattapex silt loam, 0 to 2 percent slopes.[3]				
Mattapex silt loam, 2 to 5 percent slopes, moderately eroded.[3]				
Mattapex silt loam, 5 to 10 percent slopes, moderately eroded.[3]				
Mattapex silt loam, 5 to 10 percent slopes, severely eroded.[3]				
Mattapex soils, 10 to 15 percent slopes.[3]				

See footnotes at end of table.

TABLE 15.—*Irrigation groups of soils, suitable crops, and certain water relationships*—Continued

Irrigation groups and soils	Suitable crops	Estimated maximum rate of application on nearly level land [1]	Estimated average depth to be irrigated	Estimated average available moisture to depth of irrigation [2]
		In. per hr.	*In.*	*In.*
Group 13—Continued				
Othello silt loam, 0 to 2 percent slopes.[4]				
Othello silt loam, 2 to 5 percent slopes, moderately eroded.[4]				
Othello and Elkton soils, 5 to 10 percent slopes, moderately eroded.[4]				
Pocomoke loam.[5]				
Sassafras loam, 0 to 2 percent slopes.				
Sassafras loam, 2 to 5 percent slopes, moderately eroded.				
Sassafras loam, 5 to 10 percent slopes, moderately eroded.				
Sassafras loam, 5 to 10 percent slopes, severely eroded.				
Sassafras loam, 10 to 15 percent slopes, moderately eroded.				
Woodstown loam, 0 to 2 percent slopes.				
Woodstown loam, 2 to 5 percent slopes, moderately eroded.				

[1] Water can be applied at the maximum rate only to level or nearly level land that is irrigated under ideal conditions.

[2] The figures for available moisture are estimates and are averages for all soils in the group.

[3] Soil is only moderately well drained and needs artificial drainage before it is suitable for irrigation. Alfalfa and other deep-rooted perennials may not be well suited.

[4] Soil is poorly drained and needs intensive improvement of drainage before it is suitable for irrigation. Alfalfa, Irish potatoes, sweetpotatoes, and orchards are not well suited, even after soil is drained.

[5] Soil is very poorly drained and needs very intensive improvement of drainage before it is suitable for irrigation. Alfalfa, Irish potatoes, sweetpotatoes, and orchards are not well suited, even after soil is drained.

[6] Soil is subject to flooding and is not suitable for irrigation unless it is thoroughly drained and is completely protected from floods during the crop year.

[7] The Bertie soil is somewhat poorly drained and needs moderate drainage improvement before it is suitable for irrigation More intensive drainage improvement is needed on the Othello soil. Alfalfa, potatoes, and orchards may not be well suited to the Bertie soils.

TABLE 16.—*Limitations on*

[Gravel and borrow pits (Gr) and Made land

Map symbols	Soils	Degree and kind of limitation for—		
		Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesites for homes of two stories or less
Ba	Bayboro silt loam.	Severe: high water table; very poor drainage.	Severe: too highly organic.	Severe: high water table; very poor drainage.
BoA	Bertie silt loam (in Bertie and Othello silt loams, 0 to 2 percent slopes).	Severe: high water table; somewhat poor drainage.	Slight	Severe: high water table; somewhat poor drainage.
BoB2	Bertie silt loam (in Bertie and Othello silt loams, 2 to 5 percent slopes, moderately eroded).	Severe: high water table; somewhat poor drainage.	Moderate: 2 to 5 percent slopes.	Severe: high water table; somewhat poor drainage.
Bp	Bibb silt loam.	Severe: high water table; flooding hazard; poor drainage.	Severe: flooding hazard	Severe: high water table; flooding hazard; poor drainage.
Bt	Bladen silty clay loam.	Severe: high water table; poor drainage.	Slight	Severe: high water table; poor drainage.
BuA	Butlertown silt loam, 0 to 2 percent slopes.	Severe: seasonally high water table; slow permeability.	Slight	Moderate: seasonally high water table.
BuB2	Butlertown silt loam, 2 to 5 percent slopes, moderately eroded.	Severe: seasonally high water table; slow permeability.	Moderate: 2 to 5 percent slopes.	Moderate: seasonally high water table.

Grass mixtures may consist of several kinds of grasses that are commonly used for pasture or hay and are grown with or without legumes. Orchards include apple, peach, pear, cherry, plum, prune, and pecan. "Orchards with cover" indicates that a close-growing crop, generally sod, covers the soil between the trees. "Orchards without cover" indicates that the soil between the trees is bare or nearly so at the time of irrigation.

Table 15 shows, for the different crops, the estimated maximum rate at which water can be applied if conditions are ideal and if the soils are level or nearly level. It also shows the depth to which the soil should be irrigated and the average amount of moisture available to the depth of irrigation.

In the following paragraphs the irrigation groups in Queen Annes County are discussed.

Irrigation group 1.—In this group are the sandiest agricultural soils in the county. These soils can be irrigated fairly rapidly because they take in water rapidly, but they retain less moisture than soils in the other groups. Irrigation water should be applied fairly frequently and in relatively small amounts. The soils of this group generally are less productive then those of other groups, but they can be used intensively for truck crops and other crops of high value per acre.

Irrigation group 3.—The soils in this group are less productive than the soils in groups 9, 10, 12, and 13. But they are generally more productive than the soils in group 1 and, below a depth of about 20 inches, have a slightly higher moisture-holding capacity. These soils can be used intensively for truck crops and other crops of high acre value. For most crops, irrigation water should be applied more slowly than on the soils in group 1.

Irrigation group 9.—The soils in group 9 have a higher moisture-holding capacity than the soils in groups 1 and 3. Generally, their subsoil is moderately permeable and, nearly everywhere, is underlain by sandy material below a depth of 30 to 36 inches. The level or nearly level soils can be irrigated at a moderate rate, ranging from 0.6 inch per hour in level, clean-cultivated areas to 1 inch per hour in fields protected by a cover of plants. These soils are among the better agricultural soils of the county.

Irrigation group 10.—In Queen Annes County the soils in this group are on flood plains. Their chief characteristic that affects irrigation is the uniformly medium texture from the surface to a depth of 30 inches or more. Irrigation water can thus be applied at a moderate rate, for the water readily infiltrates the soil and moistens the root zone of most crops.

Irrigation group 12.—The soils in this group are fairly shallow over heavy silty clay loam, silty clay, or clay that is slowly or very slowly permeable. Unless irrigation water is applied slowly to these soils, it tends to pond in level or depressional areas and to run off in sloping areas. Attempts to irrigate to a depth greater than about 18 inches generally are not successful. Except in areas used for special crops that bring a high economic return, irrigating these soils may not be justified.

Irrigation group 13.—The soils in this group have a

soils for specified nonfarm uses

(Ma) are not rated, because they are too variable]

Degree and kind of limitation for—Continued				
Landscaping and earth movement	Streets and parking lots	Borrow material for sanitary land fill	Cemeteries	Home gardens
Severe: high water table; very poor drainage.	Severe: high water table; very poor drainage.	Severe: too sticky; too highly organic.	Severe: high water table; very poor drainage.	Severe: high water table; very poor drainage.
Severe: high water table; somewhat poor drainage.	Moderate: high water table; somewhat poor drainage.	Moderate: sticky	Severe: high water table; somewhat poor drainage.	Severe: high water table; somewhat poor drainage.
Severe: high water table; somewhat poor drainage.	Moderate: high water table; somewhat poor drainage.	Moderate: sticky	Severe: high water table; somewhat poor drainage.	Severe: high water table; somewhat poor drainage.
Severe: high water table; flooding hazard; poor drainage.	Severe: high water table; flooding hazard; poor drainage.	Slight	Severe: high water table; flooding hazard; poor drainage.	Severe: high water table; flooding hazard; poor drainage.
Severe: high water table; poor drainage.	Severe: high water table; poor drainage.	Severe: very sticky	Severe: high water table; poor drainage.	Severe: high water table; poor drainage; very sticky.
Moderate: seasonally wet.	Moderate: seasonally wet.	Slight	Severe: seasonally high water table.	Severe: seasonally wet; slow permeability.
Moderate: seasonally wet.	Moderate: seasonally wet.	Slight	Severe: seasonally high water table.	Severe: seasonally wet; slow permeability.

TABLE 16.—*Limitations on soils for*

Map symbols	Soils	Degree and kind of limitation for—		
		Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesites for homes of two stories or less
BuC2 BuC3	Butlertown silt loam, 5 to 10 percent slopes, moderately eroded. Butlertown silt loam, 5 to 10 percent slopes, severely eroded.	Severe: seasonally high water table; slow permeability.	Severe: 5 to 10 percent slopes.	Moderate: seasonally high water table.
Cb	Coastal beaches.	Severe: tidal flooding	Severe: tidal flooding; rapid permeability.	Severe: loose material; little stability.
DoA	Downer loamy sand, 0 to 2 percent slopes.	Slight	Severe: moderately rapid permeability.	Slight
DoB	Downer loamy sand, 2 to 5 percent slopes.	Slight	Severe: moderately rapid permeability.	Slight
DoC DoC3	Downer loamy sand, 5 to 10 percent slopes. Downer loamy sand, 5 to 10 percent slopes, severely eroded.	Moderate: 5 to 10 percent slopes.	Severe: 5 to 10 percent slopes; moderately rapid permeability.	Slight
DoD DoD3	Downer loamy sand, 10 to 15 percent slopes. Downer loamy sand, 10 to 15 percent slopes, severely eroded.	Moderate: 10 to 15 percent slopes.	Severe: 10 to 15 percent slopes; moderately rapid permeability.	Moderate: 10 to 15 percent slopes.
DoE	Downer loamy sand, 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.
Ek EnA	Elkton loam. Elkton silt loam, 0 to 2 percent slopes.	Severe: high water table; poor drainage.	Slight (severe if flooded)	Severe: high water table; poor drainage.
EnB2	Elkton silt loam, 2 to 5 percent slopes, moderately eroded.	Severe: high water table; poor drainage.	Moderate: 2 to 5 percent slopes.	Severe: high water table; poor drainage.
OeC2	Elkton soil (in Othello and Elkton soils, 5 to 10 percent slopes, moderately eroded).	Severe: high water table; poor drainage.	Severe: 5 to 10 percent slopes.	Severe: high water table; poor drainage.
FaA FdA	Fallsington loam, 0 to 2 percent slopes. Fallsington sandy loam, 0 to 2 percent slopes.	Severe: high water table; poor drainage.	Slight	Severe: high water table; poor drainage.
FaB FdB	Fallsington loam, 2 to 5 percent slopes. Fallsington sandy loam, 2 to 5 percent slopes.	Severe: high water table; poor drainage.	Moderate: 2 to 5 percent slopes.	Severe: high water table; poor drainage.
GaB GcB	Galestown loamy sand, clayey substratum, 0 to 5 percent slopes. Galestown sand, clayey substratum, 0 to 5 percent slopes.	Slight: risk of polluting wells nearby.	Severe: rapid permeability.	Moderate: loose and difficult to compact
GaC GlC	Galestown loamy sand, clayey substratum, 5 to 10 percent slopes. Galestown sand (in Galestown and Lakeland sands, 5 to 10 percent slopes).	Slight: risk of polluting wells nearby.	Severe: rapid permeability.	Moderate: loose and difficult to compact.
GkD	Galestown loamy sand (in Galestown and Lakeland loamy sands, 10 to 15 percent slopes).	Moderate: 10 to 15 percent slopes; risk of polluting wells nearby.	Severe: rapid permeability.	Severe: 10 to 15 percent slopes; loose and difficult to compact.
GkE	Galestown loamy sand (in Galestown and Lakeland loamy sands, 15 to 30 percent slopes).	Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.

specified nonfarm uses—Continued

Degree and kind of limitation for—Continued				
Landscaping and earth movement	Streets and parking lots	Borrow material for sanitary land fill	Cemeteries	Home gardens
Moderate: seasonally wet.	Moderate or severe: 5 to 10 percent slopes; seasonally wet.	Slight	Severe: seasonally high water table.	Severe: seasonally wet; 5 to 10 percent slopes.
Slight	Moderate: loose and difficult to compact.	Moderate: loose and difficult to compact.	Severe: risk of tidal flooding.	Severe: droughty; infertile; risk of tidal flooding.
Slight	Slight	Slight	Slight	Moderate: somewhat droughty.
Slight	Slight	Slight	Slight	Moderate: 2 to 5 percent slopes.
Slight	Slight for streets; moderate for parking lots: 5 to 10 percent slopes.	Slight	Slight	Severe: 5 to 10 percent slopes.
Moderate: 10 to 15 cent slopes.	Moderate for streets; severe for parking lots: 10 to 15 percent slopes.	Slight	Moderate: 10 to 15 percent slopes.	Severe: 10 to 15 percent slopes.
Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.	Slight	Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.
Severe: high water table; poor drainage.	Severe: high water table; poor drainage.	Severe: too sticky	Severe: high water table; poor drainage.	Severe: high water table; poor drainage.
Severe: high water table; poor drainage.	Severe: high water table; poor drainage.	Severe: too sticky	Severe: high water table; poor drainage.	Severe: high water table; poor drainage.
Severe: high water table; poor drainage.	Severe: high water table; 5 to 10 percent slopes; poor drainage.	Severe: too sticky	Severe: high water table; poor drainage.	Severe: high water table; 5 to 10 percent slopes; poor drainage.
Severe: high water table; poor drainage.	Severe: high water table; poor drainage.	Slight	Severe: high water table; poor drainage.	Severe: high water table; poor drainage.
Severe: high water table; poor drainage.	Severe: high water table; poor drainage.	Slight	Severe: high water table; poor drainage.	Severe: high water table; poor drainage.
Slight	Moderate: loose and difficult to compact.	Moderate: loose and difficult to compact.	Slight	Severe: droughty; low fertility.
Slight	Moderate: 5 to 10 percent slopes; loose.	Moderate: loose and difficult to compact.	Slight	Severe: droughty; low fertility; 5 to 10 percent slopes.
Moderate: 10 to 15 percent slopes.	Severe: 10 to 15 percent slopes; loose.	Moderate for streets; severe for parking lots: loose and difficult to compact.	Slight	Severe: droughty; low fertility; 10 to 15 percent slopes.
Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.	Moderate: loose and difficult to compact.	Severe: 15 to 30 percent slopes.	Very severe: 15 to 30 percent slopes.

TABLE 16.—*Limitations on soils for*

Map symbols	Soils	Degree and kind of limitation for—		
		Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesites for homes of two stories or less
Jo	Johnston loam.	Severe: high water table; flooding; very poor drainage.	Severe: too highly organic; flooding.	Severe: high water table; flooding; very poor drainage.
KeA KpA	Keyport loam, 0 to 2 percent slopes. Keyport silt loam, 0 to 2 percent slopes.	Severe: seasonally high water table; slow permeability.	Slight	Moderate: seasonally high water table.
KeB2 KpB2	Keyport loam, 2 to 5 percent slopes, moderately eroded. Keyport silt loam, 2 to 5 percent slopes, moderately eroded.	Severe: seasonally high water table; slow permeability.	Moderate: 2 to 5 percent slopes.	Moderate: seasonally high water table.
KrC3 KrD3	Keyport silty clay loam, 5 to 10 percent slopes, severely eroded. Keyport silty clay loam, 10 to 15 percent slopes, severely eroded.	Severe: seasonally high water table; slow permeability.	Severe: 5 to 15 percent slopes.	Moderate: seasonally high water table.
KsA KsB	Klej loamy sand, 0 to 2 percent slopes. Klej loamy sand, 2 to 5 percent slopes.	Moderate: seasonally high water table.	Severe: rapid permeability.	Moderate: seasonally high water table.
LaB	Lakeland loamy sand, clayey substratum, 0 to 5 percent slopes.	Slight: risk of polluting wells nearby.	Severe: rapid permeability.	Slight
GlC LaC	Lakeland sand (in Galestown and Lakeland sands, 5 to 10 percent slopes). Lakeland loamy sand, clayey substratum, 5 to 10 percent slopes.	Slight: risk of polluting wells nearby.	Severe: rapid permeability.	Slight
GkD	Lakeland loamy sand (in Galestown and Lakeland loamy sands, 10 to 15 percent slopes).	Moderate: 10 to 15 percent slopes; risk of polluting wells nearby.	Severe: rapid permeability.	Severe: 10 to 15 percent slopes; loose and difficult to compact.
GkE	Lakeland loamy sand (in Galestown and Lakeland loamy sands, 15 to 30 percent slopes).	Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.
MbA McA MkA MoA	Matapeake fine sandy loam, 0 to 2 percent slopes. Matapeake loam, 0 to 2 percent slopes. Matapeake silt loam, 0 to 2 percent slopes. Matapeake silt loam, silty substratum, 0 to 2 percent slopes.	Slight or moderate: moderate permeability.	Moderate: moderately rapid permeability at depth of about 48 inches.	Slight
MbB2 McB2 MkB2 MoB2	Matapeake fine sandy loam, 2 to 5 percent slopes, moderately eroded. Matapeake loam, 2 to 5 percent slopes, moderately eroded. Matapeake silt loam, 2 to 5 percent slopes, moderately eroded. Matapeake silt loam, silty substratum, 2 to 5 percent slopes, moderately eroded.	Slight or moderate: moderate permeability.	Moderate: 2 to 5 percent slopes.	Slight
MbC2 MbC3 McC2 McC3 MkC2 MkC3 MoC2 MoC3	Matapeake fine sandy loam, 5 to 10 percent slopes, moderately eroded. Matapeake fine sandy loam, 5 to 10 percent slopes, severely eroded. Matapeake loam, 5 to 10 percent slopes, moderately eroded. Matapeake loam, 5 to 10 percent slopes, severely eroded. Matapeake silt loam, 5 to 10 percent slopes, moderately eroded. Matapeake silt loam, 5 to 10 percent slopes, severely eroded. Matapeake silt loam, silty substratum, 5 to 10 percent slopes, moderately eroded. Matapeake silt loam, silty substratum, 5 to 10 percent slopes, severely eroded.	Moderate: 5 to 10 percent slopes.	Severe: 5 to 10 percent slopes.	Slight

specified nonfarm uses—Continued

Degree and kind of limitation for—Continued				
Landscaping and earth movement	Streets and parking lots	Borrow material for sanitary land fill	Cemeteries	Home gardens
Severe: high water table; very poor drainage.	Severe: high water table; flooding; very poor drainage.	Severe: too highly organic.	Severe: high water table; flooding; very poor drainage.	Severe: high water table; flooding; very poor drainage.
Moderate: seasonally wet; sticky.	Moderate: seasonally wet.	Severe: too sticky	Severe: seasonally high water table; slow permeability.	Moderate: seasonally wet.
Moderate: seasonally wet; sticky.	Moderate: seasonally wet.	Severe: too sticky	Severe: seasonally high water table; slow permeability.	Moderate: seasonally wet; 2 to 5 percent slopes.
Severe: seasonally wet; sticky; 5 to 15 percent slopes.	Severe: seasonally wet; 5 to 15 percent slopes.	Moderate for streets; severe for parking lots: very sticky.	Severe: seasonally high water table; slow permeability.	Very severe: seasonally wet; very sticky; 5 to 15 percent slopes.
Moderate: seasonally high water table.	Moderate: loose; seasonally high water table.	Moderate: loose and difficult to compact.	Moderate: seasonally high water table.	Severe: seasonally high water table; low fertility.
Slight	Slight: (loose and difficult to compact).	Moderate: loose and difficult to compact.	Severe: droughty	Severe: droughty; low fertility.
Slight	Slight for streets; moderate for parking lots: 5 to 10 percent slopes; loose.	Moderate: loose and difficult to compact.	Severe: droughty	Severe: droughty; low fertility; 5 to 10 percent slopes.
Moderate: 10 to 15 percent slopes.	Moderate for streets; severe for parking lots: 10 to 15 percent slopes; loose.	Moderate: loose and difficult to compact.	Severe: droughty	Severe: droughty; low fertility; 10 to 15 percent slopes.
Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.
Slight	Slight	Slight	Slight	Slight.
Slight	Slight	Slight	Slight	Moderate: 2 to 5 percent slopes.
Slight	Slight for streets; moderate for parking lots: 5 to 10 percent slopes.	Slight	Slight	Severe: 5 to 10 percent slopes.

TABLE 16.—*Limitations on soil for*

Map symbols	Soils	Degree and kind of limitation for—		
		Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesites for homes of two stories or less
MmD MmD3	Matapeake soils, 10 to 15 percent slopes. Matapeake soils, 10 to 15 percent slopes, severely eroded.	Moderate: 10 to 15 percent slopes.	Severe: 10 to 15 percent slopes.	Moderate: 10 to 15 percent slopes.
MmE	Matapeake soils, 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.	Moderate or severe: 15 to 30 percent slopes.
MpA MsA MtA	Mattapex fine sandy loam, 0 to 2 percent slopes. Mattapex loam, 0 to 2 percent slopes. Mattapex silt loam, 0 to 2 percent slopes.	Severe: seasonally high water table; moderately slow permeability.	Slight	Moderate: seasonally high water table.
MpB2 MsB2 MtB2	Mattapex fine sandy loam, 2 to 5 percent slopes, moderately eroded. Mattapex loam, 2 to 5 percent slopes, moderately eroded. Mattapex silt loam, 2 to 5 percent slopes, moderately eroded.	Severe: seasonally high water table; moderately slow permeability.	Moderate: 2 to 5 percent slopes.	Moderate: seasonally high water table.
MsC2 MsC3 MtC2 MtC3	Mattapex loam, 5 to 10 percent slopes, moderately eroded. Mattapex loam, 5 to 10 percent slopes, severely eroded. Mattapex silt loam, 5 to 10 percent slopes, moderately eroded. Mattapex silt loam, 5 to 10 percent slopes, severely eroded.	Severe: seasonally high water table; moderately slow permeability.	Moderate or severe: 5 to 10 percent slopes.	Moderate: seasonally high water table.
MxD MxD3	Mattapex soils, 10 to 15 percent slopes. Mattapex soils, 10 to 15 percent slopes, severely eroded.	Severe: seasonally high water table; 10 to 15 percent slopes.	Severe: 10 to 15 percent slopes.	Moderate: seasonally high water table; 10 to 15 percent slopes.
MxE	Mattapex soils, 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.	Moderate or severe: 15 to 30 percent slopes.
My	Mixed alluvial land.	Severe: high water table; flooding.	Severe: flooding	Severe: high water table; flooding.
ObA BoA	Othello silt loam, 0 to 2 percent slopes. Othello silt loam (in Bertie and Othello silt loams, 0 to 2 percent slopes).	Severe: high water table; poor drainage.	Slight	Severe: high water table; poor drainage.
ObB2 BoB2	Othello silt loam, 2 to 5 percent slopes, moderately eroded. Othello silt loam (in Bertie and Othello silt loams, 2 to 5 percent slopes, moderately eroded).	Severe: high water table; poor drainage.	Moderate: 2 to 5 percent slopes.	Severe: high water table; poor drainage.
OeC2	Othello soil (in Othello and Elkton soils, 5 to 10 percent slopes, moderately eroded).	Severe: high water table; poor drainage.	Severe: 5 to 10 percent slopes.	Severe: high water table; poor drainage.
Pd	Plummer loamy sand.	Severe: high water table; poor drainage.	Severe: rapid permeability.	Severe: high water table; poor drainage.
Pk Pm	Pocomoke loam. Pocomoke sandy loam.	Severe: high water table; very poor drainage.	Severe: too highly organic.	Severe: high water table; very poor drainage.
Po	Portsmouth silt loam.	Severe: high water table; very poor drainage.	Severe: too highly organic.	Severe: high water table; very poor drainage.
SaA SfA	Sassafras loam, 0 to 2 percent slopes. Sassafras sandy loam, 0 to 2 percent slopes.	Slight	Severe: moderately rapid permeability.	Slight

specified nonfarm uses—Continued

Degree and kind of limitation for—Continued				
Landscaping and earth movement	Streets and parking lots	Borrow material for sanitary land fill	Cemeteries	Home gardens
Moderate: 10 to 15 percent slopes.	Moderate for streets; severe for parking lots: 10 to 15 percent slopes.	Slight	Moderate: 10 to 15 percent slopes.	Severe: 10 to 15 percent slopes.
Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.	Slight	Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.
Moderate: seasonally wet.	Moderate: seasonally wet.	Slight	Moderate: seasonally high water table.	Moderate: seasonally wet.
Moderate: seasonally wet.	Moderate: seasonally wet.	Slight	Moderate: seasonally high water table.	Moderate: seasonally wet; 2 to 5 percent slopes.
Moderate: seasonally wet.	Moderate: 5 to 10 percent slopes; seasonally wet.	Slight	Moderate: seasonally high water table.	Severe: seasonally wet; 5 to 10 percent slopes.
Moderate: seasonally wet.	Moderate for streets; severe for parking lots: 10 to 15 percent slopes.	Slight	Moderate: seasonally high water table.	Severe: 10 to 15 percent slopes.
Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.	Slight	Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.
Severe: high water table; flooding.	Severe: high water table; flooding.	Slight	Severe: high water table; flooding.	Severe: high water table; flooding.
Severe: high water table; poor drainage.	Severe: high water table; poor drainage.	Moderate: too sticky	Severe: high water table; poor drainage.	Severe: high water table; poor drainage.
Severe: high water table; poor drainage.	Severe: high water table; poor drainage.	Moderate: too sticky	Severe: high water table; poor drainage.	Severe: high water table; poor drainage.
Severe: high water table; poor drainage.	Severe: high water table; poor drainage.	Moderate: too sticky	Severe: high water table; poor drainage.	Severe: high water table; 5 to 10 percent slopes; poor drainage.
Severe: high water table; poor drainage.	Severe: high water table; poor drainage.	Moderate: loose and difficult to compact.	Severe: high water table; poor drainage.	Severe: high water table; poor drainage; very low fertility.
Severe: high water table; very poor drainage.	Severe: high water table; very poor drainage.	Severe: too highly organic.	Severe: high water table; very poor drainage.	Severe: high water table; very poor drainage.
Severe: high water table; very poor drainage.	Severe: high water table; very poor drainage.	Severe: too highly organic.	Severe: high water table; very poor drainage.	Severe: high water table; very poor drainage.
Slight	Slight	Slight	Slight	Slight.

TABLE 16.—*Limitations or soils for*

Map symbols	Soils	Degree and kind of limitation for—		
		Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesites for homes of two stories or less
SaB2 SfB2	Sassafras loam, 2 to 5 percent slopes, moderately eroded. Sassafras sandy loam, 2 to 5 percent slopes, moderately eroded.	Slight	Severe: moderately rapid permeability.	Slight
SaC2 SaC3 SfC2 SfC3	Sassafras loam, 5 to 10 percent slopes, moderately eroded. Sassafras loam, 5 to 10 percent slopes, severely eroded. Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded. Sassafras sandy loam, 5 to 10 percent slopes, severely eroded.	Moderate: 5 to 10 percent slopes.	Severe: 5 to 10 percent slopes.	Slight
SaD2 SaD3 SfD2 SfD3	Sassafras loam, 10 to 15 percent slopes, moderately eroded. Sassafras loam, 10 to 15 percent slopes, severely eroded. Sassafras sandy loam, 10 to 15 percent slopes, moderately eroded. Sassafras sandy loam, 10 to 15 percent slopes, severely eroded.	Moderate: 10 to 15 percent slopes.	Severe: 10 to 15 percent slopes.	Moderate: 10 to 15 percent slopes.
SaE SfE SfE3 SfF	Sassafras loam, 15 to 30 percent slopes. Sassafras sandy loam, 15 to 30 percent slopes. Sassafras sandy loam, 15 to 30 percent slopes, severely eroded. Sassafras sandy loam, 30 to 60 percent slopes.	Severe: 15 to 60 percent slopes.	Severe: 15 to 60 percent slopes.	Moderate (15 to 25 percent slopes) or severe (25 to 60 percent slopes).
Sw	Swamp.	Severe: very high water table.	Severe: very high water table; variable material.	Severe: very high water table.
Tm	Tidal marsh.	Severe: tidal flooding	Severe: tidal flooding	Severe: tidal flooding
WdA WoA	Woodstown loam, 0 to 2 percent slopes. Woodstown sandy loam, 0 to 2 percent slopes.	Moderate: seasonally high water table.	Severe: moderately rapid permeability.	Moderate: seasonally high water table.
WdB2 WoB2	Woodstown loam, 2 to 5 percent slopes, moderately eroded. Woodstown sandy loam, 2 to 5 percent slopes, moderately eroded.	Moderate: seasonally high water table.	Severe: moderately rapid permeability.	Moderate: seasonally high water table.
WoC2	Woodstown sandy loam, 5 to 10 percent slopes, moderately eroded.	Severe: seasonally high water table.	Severe: 5 to 10 percent slopes.	Moderate: seasonally high water table.
WoD	Woodstown sandy loam, 10 to 15 percent slopes.	Severe: seasonally high water table; 10 to 15 percent slopes.	Severe: 10 to 15 percent slopes.	Severe: seasonally high water table; 10 to 15 percent slopes.
WoE	Woodstown sandy loam, 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.

specified nonfarm uses—Continued

Degree and kind of limitation for—Continued				
Landscaping and earth movement	Streets and parking lots	Borrow material for sanitary land fill	Cemetaries	Home gardens
Slight	Slight	Slight	Slight	Moderate: 2 to 5 percent slopes.
Slight	Slight for streets; moderate for parking lots: 5 to 10 percent slopes.	Slight	Slight	Severe: 5 to 10 percent slopes.
Moderate: 10 to 15 percent slopes.	Moderate for streets; severe for parking lots: 10 to 15 percent slopes.	Slight	Moderate: 10 to 15 percent slopes.	Severe: 10 to 15 percent slopes.
Severe: 15 to 60 percent slopes.	Severe: 15 to 60 percent slopes.	Slight	Severe: 15 to 60 percent slopes.	Severe: 15 to 60 percent slopes.
Severe: very high water table.	Severe: very high water table.	Severe: highly variable material.	Severe: very high water table.	Very severe: very high water table.
Severe: tidal flooding	Severe: tidal flooding	Severe: tidal flooding; highly variable material.	Severe: tidal flooding	Very severe: tidal flooding.
Moderate: seasonally wet.	Moderate: seasonally wet.	Slight	Moderate: seasonally high water table.	Moderate: seasonally wet.
Moderate: seasonally wet.	Moderate: seasonally wet.	Slight	Moderate: seasonally high water table.	Moderate: seasonally wet; 2 to 5 percent slopes.
Moderate: seasonally wet.	Moderate: 5 to 10 percent slopes; seasonally wet.	Slight	Moderate: seasonally high water table.	Severe: seasonally wet; 5 to 10 percent slopes.
Moderate: seasonally wet.	Moderate for streets; severe for parking lots: 10 to 15 percent slopes.	Slight	Severe: seasonally high water table.	Severe: 10 to 15 percent slopes.
Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.	Slight	Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.

much higher moisture-holding capacity than those in groups 1 and 3. In most places they can be irrigated at a moderate rate, or a rate of about 0.4 inch per hour in level, clean-cultivated areas. These soils are among the best for agriculture in the county. They store a fairly large to large amount of water and, during dry periods, require irrigation less frequently than most other soils.

Nonfarm Uses of Soils

Although Queen Annes County is still a rural area, its population is growing and its suburbs are spreading fairly rapidly. In recent years there has been a large and rapid increase in residential and commercial uses of the land—especially for homes and resorts on rivers and bays and for commercial development along some of the highways. The rate of growth and spread is expected to increase in the near future.

Accompanying these changes is a growing demand for information about soil conditions that affect nonfarm uses. The most urgent need is for information about the limitations on soils for use in the disposal of sewage effluent from septic tanks. Less urgent are requests for information about the use of soils for building foundations, in earth moving and landscaping, for streets and parking lots, and for other uses.

Table 16 rates the limitations of each soil in the county as *slight*, *moderate*, or *severe*, according to the degree that the soil is limited in its specified nonfarm uses. A rating of slight may indicate that a soil has no limitations at all, though most soils in the county are at least slightly limited in use.

The ratings are based on the degree of the greatest single limitation. For example, if flooding severely limits use of a soil in the disposal of sewage effluent from septic tanks, the limitations are rated severe, though the soil may be well suited to that use in all other respects.

A rating of severe for a particular use does not mean that a soil so rated cannot be put to that use. For example, a soil with a high water table may be severely limited in its use for cemeteries and still be used for them, if measures are taken to improve drainage or to lower the water table. Likewise, a soil having a wet, plastic and unstable substratum can be used as foundations for homes if it can be drained and stabilized without too much expense.

Following are the properties that limit the soils of the county in their suitability for each use specified in table 16.

Disposal of sewage effluent from septic tanks: Permeability of the soil, depth to a seasonally high water table, natural drainage, hazard of flooding, depth to an impervious layer, and steepness of slope.

Sewage lagoons: Permeability of the soil, depth to an impervious layer, steepness of slope, hazard of flooding, and organic-matter content.

Foundations for homes of two stories or less: Depth to water table, natural drainage, steepness of slope, depth to bedrock (assuming a 6-foot basement), hazard of flooding, and texture of the surface soil. For industrial or commercial buildings and for homes of more than two stories, investigation should be made on the site.

Landscaping and earth movement: Texture of the surface soil and subsoil, plasticity and stability of the subsoil and substratum, wetness, height of water table, susceptibility to frost action, and limitations to working the soil when it is wet or frozen.

Streets and parking lots: Wetness and depth to water table, steepness of slope, and hazard of flooding.

Material for sanitary land fill: Texture of the soil, plasticity, organic-matter content, and thickness of available soil material.

Cemeteries: Depth to water table, natural drainage, depth to cemented layers, plasticity and stability of the subsoil and substratum, degree of stoniness, hazard of flooding, and steepness of slope.

Home gardens: Texture of the surface soil, permeability of the subsoil, steepness of slope, moisture-holding capacity, depth to water table, natural drainage, and degree of erosion.

Recreational Uses of Soils

This subsection gives ratings for the limitations on soils that are used for recreational activities. Table 17 lists the soils in the county and shows the kinds and estimated degree of limitations that affect their use for various purposes. Ratings for the degree of limitations are expressed in relative terms—slight, moderate, or severe.

The aspects of outdoor recreation that are rated in table 17 are buildings in recreational areas, such as seasonal and year-round cottages, washrooms, bathhouses, picnic shelters, and service buildings; paths and trails for hiking, studying nature, or enjoying the scenery; athletic fields and other intensive play areas that are subject to heavy foot traffic, such as baseball diamonds, football fields, and badminton areas; parks and extensive play areas where pedestrian traffic is usually not heavy or concentrated; intensively used picnic areas; and campsites, including tent and trailer sites and their accompanying activities. Not rated in the table is the suitability of the soils as drainage fields for septic tanks. For this rating, see table 16, p. 80.

The major properties that limit the use of soils for these recreational activities are wetness, natural drainage, depth to the water table, and the hazard of flooding; soil permeability, which affects the ease or difficulty of improving drainage; texture and stability of the surface soil; and slope.

The properties named are not necessarily limiting for all of the specified uses, but most of them are limiting for most uses, and some of them for all. In addition, any one property may not restrict all types of recreation equally. For example, a significant slope limits the use of a soil for a football field, and slopes of more than 5 percent severely limit such use, for on these slopes much leveling is required to create a football field. On the other hand, the only slopes that limit the use of soils for campsites and picnic areas are those exceeding about 15 percent, if there are no other limitations.

Use of the Soil Survey in Community Planning

In planning the use of soils for different activities in a community, reliable information about the soils helps in determining the best use for each area. As a rule, the

soils that are best for agriculture are also suitable for building sites and other nonagricultural uses. Therefore, an orderly plan for land use is desirable.

In Queen Annes County the soils most suitable for agriculture without artificial drainage are the Downer, Matapeake, and Sassafras soils, particularly in nearly level or gently sloping areas where slopes do not exceed 5 percent. Many other soils in the county also are good for agriculture if they are adequately drained. The agricultural uses of soils are discussed in the section "Use and Management of the Soils."

Table 16 shows that limitations on the disposal of effluent from septic tanks are slight only on Downer, Galestown, Lakeland, Matapeake, and Sassafras soils having slopes of 0 to 5 percent. That rating applies only to areas of those soils where the density of housing is low. Consequently, those are the only soils suitable for use as residential areas if the disposal of sewage is to be through septic tanks. The soils that have slight limitations to use for septic tanks make up about 30 percent of the county. If homesites are planned in areas of all other soils in the county, a community system for disposing of sewage is needed, or special means of disposal must be used.

In any community, land is needed for recreational areas. The only soils in the county that have slight limitations to use for athletic fields and and other nearly level play areas are Matapeake loam, Matapeake fine sandy loam, Sassafras loam, and Sassafras sandy loam, all having slopes of 0 to 2 percent. These soils occupy only 3 percent of the county. Many other soils have only moderate limitations that restrict their use for intensive play. These soils are seasonally wet, or have slopes of 2 to 5 percent, or are too coarse or too fine in texture to provide a good surface for play (see table 17, p. 92).

All soils in the Downer, Matapeake, and Sassafras series on slopes of no more than 15 percent have only slight limitations to use for parks and other recreational areas in which nearly level land is not needed. Steep hillsides and the adjoining narrow bottom lands are not well suited to use as farms or as building lots, but together they are highly useful for some kinds of recreation. These areas could well be reserved for parks.

Also important in the development of recreational areas are artificial ponds. Table 12, in the subsection "Engineering Uses of Soils," lists the suitability of the soils in the county as sites for ponds, and it names the type of pond that is suitable.

Formation and Classification of Soils

This section consists of five main parts. The first part explains the factors of soil formation as they relate to the formation of soils in Queen Annes County. In the second part is discussed the interrelationships of soil series in the county. The third part discusses the morphology of soils. In the fourth part each soil series represented in the county is placed in its respective family, subgroup, and order of the new system for classifying soils and also is placed in its respective great soil group and order of the old classification system. The new soil orders and subgroups represented in the county are briefly defined. In the fifth part is a description of each soil series in Queen Annes County, including a profile of a soil that is representative of the series.

For further information about the new system for classifying soils, refer to "Soil Classification, a Comprehensive System" (*12*).

Factors of Soil Formation

Soils are products of soil-forming processes acting upon materials altered or deposited by geologic forces. They are natural, three-dimensional bodies on the surface of the earth, capable of supporting plants. Each soil has distinct morphology or measurable set of properties. Each set of properties depends on a particular combination of the processes and factors that determine the environment of the soil. The factors that contribute to the differences among soils are climate, plant and animal life, parent material, topography, and time.

Climate

Queen Annes County has the rather humid, temperate climate that is typical of most coastal or near coastal areas of the Middle Atlantic States. Facts about the temperature and precipitation are given in tables 1 and 2 in the section "General Nature of the County."

The climate is fairly uniform throughout the county. There are no significant differences in elevation and no obstructions to the movements of winds, clouds, and rainstorms. Masses of air generally move through the county from a northwesterly direction, but they are warmed by air that moves in periodically from the south and southwest.

Because precipitation exceeds evapotranspiration, this humid, rather uniform climate has caused the soils to be strongly leached. Most of the soluble materials that either were originally present or were released through weathering have been removed. Largely for this reason, the soils of the county are strongly acid and generally are low in plant nutrients.

Precipitation is mainly responsible for the subsoil that characterizes most soils in the county. In addition to leaching soluble materials, water that percolates through the soil moves clay from the surface layer to a subsoil layer. Except for soils formed in recent alluvium or sand, soils of the county have a subsoil that contains more clay than the surface layer.

Also influenced by climate is the formation of blocky structure in the subsoil of well-developed soils. The development of peds (aggregates) in the subsoil is caused by changes in volume of the soil mass that are primarily the result of alternate wetting and drying and of alternate freezing and thawing.

Weathering of minerals occurs at a rate that is related to temperature and moisture supply. Soils in tropical regions weather more rapidly than those in temperate regions. Soils in humid regions weather more rapidly than those in arid regions. In Queen Annes County the soils are relatively low in weatherable minerals. No free carbonates are in them, and most of the bases have been leached out. However, because the soils formed in transported parent materials that previously had undergone

TABLE 17.—*Limitations of soils*

[Gravel and borrow pits (Gr) and Made land (Ma)

Soil series and map symbols	Degree and kinds of limitations for—	
	Service buildings in recreational areas (2 stories or less)	Paths and trails
Bayboro (Ba)	Severe: high water table; very poorly drained.	Severe: very poorly drained.
Bertie (BoA, BoB2)	Severe: somewhat poorly drained	Moderate: somewhat poorly drained; silty
Bibb (Bp)	Severe: poorly drained; subject to flooding.	Severe: poorly drained; subject to flooding.
Bladen (Bt)	Severe: high water table; poorly drained	Severe: poorly drained
Butlertown:		
(BuA, BuB2)	Moderate: moderately well drained	Moderate: silty
(BuC2, BuC3)	Moderate: 5 to 10 percent slopes	Moderate: silty
Coastal beaches (Cb)	Severe: tidal flooding; loose sand	Severe: tidal flooding; loose sand
Downer:		
(DoA, DoB)	Slight	Moderate: loamy sand
(DoC, DoC3, DoD, DoD3)	Moderate: 5 to 15 percent slopes	Moderate: loamy sand
(DoE)	Severe: 15 to 30 percent slopes	Severe: 15 to 30 percent slopes
Elkton (Ek, EnA, EnB2)	Severe: high water table; poorly drained	Severe: poorly drained
Fallsington (FaA, FaB, FdA, FdB)	Severe: high water table; poorly drained	Severe: poorly drained
Galestown:		
(GaB)	Slight	Moderate: loamy sand
(GaC, GkD)	Moderate: 5 to 15 percent slopes	Moderate: loamy sand
(GcB)	Slight	Severe: loose sand
(GkE)	Severe: 15 to 30 percent slopes	Severe: 15 to 30 percent slopes
(GlC)	Moderate: 5 to 10 percent slopes	Severe: loose sand
Johnston (Jo)	Severe: very poorly drained; subject to flooding.	Severe: very poorly drained; subject to flooding.
Keyport:		
(KeA, KeB2)	Moderate: seasonally high water table	Slight
(KpA, KpB2)	Moderate: seasonally high water table	Moderate: silty
(KrC3, KrD3)	Moderate: 5 to 15 percent slopes	Moderate: silty
Klej (KsA, KsB)	Moderate: seasonally high water table	Moderate: loamy sand
Lakeland:		
(LaB)	Moderate: 0 to 5 percent slopes	Moderate: loamy sand
(LaC)	Moderate: 5 to 10 percent slopes	Moderate: loamy sand

for specified recreational uses

are not included, because they are too variable]

Degree and kinds of limitations for—Continued			
Athletic fields and other intensive play areas	Parks and extensive play areas	Intensively used picnic areas	Campsites for tents and trailers
Severe: very poorly drained; very slow permeability.	Severe: high water table; very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.
Severe: somewhat poorly drained; silty; slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; silty.	Severe: somewhat poorly drained; silty; slow permeability.
Severe: poorly drained; subject to flooding.	Severe: poorly drained; subject to flooding.	Severe: poorly drained; subject to flooding.	Severe: poorly drained; subject to flooding.
Severe: poorly drained; very slow permeability.	Severe: high water table; poorly drained.	Severe: poorly drained.	Severe: poorly drained; very slow permeability.
Moderate: silty; moderately slow permeability.	Slight: seasonal wetness.	Slight: silty.	Severe: silty; moderately slow permeability.
Moderate: 5 to 10 percent slopes.	Moderate: 5 to 10 percent slopes.	Moderate: silty.	Severe: silty; 5 to 10 percent slopes; slow permeability.
Severe: tidal flooding; loose sand; very difficult to sod.	Severe: tidal flooding; loose sand; very difficult to sod.	Severe: tidal flooding; loose sand.	Severe: tidal flooding; loose sand.
Moderate: loamy sand.	Slight.	Slight.	Slight.
Severe: 5 to 15 percent slopes.	Moderate: 5 to 15 percent slopes.	Moderate: 5 to 15 percent slopes.	Moderate for tents; moderate or severe for trailers: 5 to 15 percent slopes.
Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.
Severe: poorly drained; very slow permeability.	Severe: high water table; poorly drained.	Severe: poorly drained.	Severe: poorly drained; very slow permeability.
Severe: poorly drained.	Severe: high water table; poorly drained.	Severe: poorly drained.	Severe: poorly drained.
Moderate: loamy sand; difficult to sod.	Moderate: loose and difficult to sod.	Moderate: loamy sand; difficult to sod.	Moderate: loamy sand.
Severe: 5 to 15 percent slopes.	Moderate: loose and difficult to sod.	Moderate: loamy sand; difficult to sod.	Moderate for tents; moderate or severe for trailers: loamy sand; slopes.
Severe: loose sand.	Moderate: loose and difficult to sod.	Severe: loose sand.	Severe: loose sand.
Severe: 15 to 30 percent slopes.	Severe: loose and difficult to sod.	Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.
Severe: loose sand.	Severe: loose and difficult to sod.	Severe: loose sand.	Severe: loose sand.
Severe: very poorly drained; subject to flooding.	Severe: very poorly drained; subject to flooding.	Severe: very poorly drained; subject to flooding.	Severe: very poorly drained subject to flooding.
Severe: slow permeability.	Slight.	Slight.	Severe: slow permeability.
Severe: slow permeability.	Slight.	Slight.	Severe: slow permeability.
Severe: 5 to 15 percent slopes.	Moderate: seasonal wetness; 5 to 15 percent slopes.	Moderate: 5 to 15 percent slopes.	Severe: slow permeability.
Moderate: loamy sand.	Slight.	Slight.	Moderate: loamy sand; seasonally high water table.
Moderate: loamy sand; difficult to sod.	Moderate: loose and difficult to sod.	Moderate: loamy sand; difficult to sod.	Moderate: loamy sand.
Severe: 5 to 10 percent slopes.	Moderate: loose and difficult to sod.	Moderate: loamy sand; difficult to sod.	Moderate for tents; moderate or severe for trailers: loamy sand; slopes.

TABLE 17.—*Limitations of soils for*

Soil series and map symbols	Degree and kinds of limitations for—	
	Service buildings in recreational areas (2 stories or less)	Paths and trails
Matapeake:		
(MbA, McA)	Slight	Slight
(MbB2, McB2)	Slight	Slight
(MbC2, MbC3, McC2, McC3)	Moderate: 5 to 10 percent slopes	Slight
(MkA, MoA)	Slight	Moderate: silty
(MkB2, MoB2)	Slight	Moderate: silty
(MkC2, MkC3, MoC2, MoC3, MmD, MmD3).	Moderate: 5 to 15 percent slopes	Moderate: silty
(MmE)	Severe: 15 to 30 percent slopes	Severe: 15 to 30 percent slopes
Mattapex:		
(MpA, MpB2, MsA, MsB2)	Moderate: seasonally high water table	Slight
(MsC2, MsC3)	Moderate: seasonally high water table	Slight
(MtA, MtB2)	Moderate: seasonally high water table	Moderate: silty
(MtC2, MtC3, MxD, MxD3)	Moderate: seasonally high water table	Moderate: silty
(MxE)	Severe: 15 to 30 percent slopes	Severe: silty; 15 to 30 percent slopes
Mixed alluvial land (My)	Severe: high water table; subject to flooding.	Severe: high water table; subject to flooding.
Othello (ObA, ObB2, OeC2)	Severe: high water table; poorly drained	Severe: poorly drained
Plummer (Pd)	Severe: high water table; poorly drained.	Severe: poorly drained; loose
Pocomoke (Pk, Pm)	Severe: high water table; very poorly drained.	Severe: very poorly drained
Portsmouth (Po)	Severe: high water table; very poorly drained.	Severe: very poorly drained
Sassafras:		
(SaA, SfA)	Slight	Slight
(SaB2, SfB2)	Slight	Slight
(SaC2, SaC3, SfC2, SfC3, SaD2, SaD3, SfD2, SfD3)	Moderate: 5 to 15 percent slopes	Slight
(SaE, SfE, SfE3, SfF)	Severe: 15 to 60 percent slopes	Severe: 15 to 60 percent slopes
Swamp (Sw)	Severe: ponded	Severe: ponded
Tidal marsh (Tm)	Severe: marshy	Severe: marshy
Woodstown:		
(WdA, WoA, WdB2, WoB2)	Moderate: seasonally high water table	Slight
(WoC2, WoD)	Moderate: seasonally high water table	Slight
(WoE)	Severe: 15 to 30 percent slopes	Severe: 15 to 30 percent slopes

specified recreational uses—Continued

Degree and kinds of limitations for—Continued			
Athletic fields and other intensive play areas	Parks and extensive play areas	Intensively used picnic areas	Campsites for tents and trailers
Slight	Slight	Slight	Slight.
Slight	Slight	Slight	Slight.
Moderate: 5 to 10 percent slopes.	Slight	Slight	Moderate: 5 to 10 percent slopes.
Slight	Slight	Slight	Slight.
Slight	Slight	Slight	Slight.
Moderate or severe: 5 to 15 percent slopes.	Slight or moderate: slopes	Slight or moderate: silty; 5 to 15 percent slopes.	Slight or moderate for tents; moderate or severe for trailers: silty; 5 to 15 percent slopes.
Severe: 15 to 30 percent slopes	Severe: 15 to 30 percent slopes	Severe: 15 to 30 percent slopes	Severe: 15 to 30 percent slopes.
Moderate: moderately slow permeability.	Slight	Slight	Moderate: moderately slow permeability.
Moderate: 5 to 10 percent slopes	Slight	Slight	Moderate: 5 to 10 percent slopes; moderately slow permeability.
Moderate: silty; moderately slow permeability.	Slight	Slight	Moderate: silty; moderately slow permeability.
Moderate or severe: 5 to 15 percent slopes.	Moderate: seasonal wetness	Moderate: silty; 5 to 15 percent slopes.	Moderate for tents; moderate or severe for trailers: silty; moderately slow permeability; slopes.
Severe: 15 to 30 percent slopes	Severe: seasonal wetness; 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes	Severe: 15 to 30 percent slopes.
Severe: high water table; subject to flooding.	Severe: high water table; subject to flooding.	Severe: high water table; subject to flooding.	Severe: high water table; subject to flooding.
Severe: poorly drained	Severe: high water table; poorly drained.	Severe: poorly drained	Severe: poorly drained.
Severe: poorly drained; loose	Severe: high water table; poorly drained.	Severe: poorly drained; loose	Severe: poorly drained; loose.
Severe: very poorly drained	Severe: high water table; very poorly drained.	Severe: very poorly drained	Severe: very poorly drained.
Severe: very poorly drained	Severe: high water table; very poorly drained.	Severe: very poorly drained	Severe: very poorly drained.
Slight	Slight	Slight	Slight.
Slight: 2 to 5 percent slopes	Slight	Slight	Slight.
Moderate or severe: 5 to 15 percent slopes.	Moderate	Moderate: 5 to 15 percent slopes.	Moderate for tents; moderate or severe for trailers: 5 to 15 percent slopes.
Severe: 15 to 60 percent slopes	Severe: 15 to 60 percent slopes.	Severe: 15 to 60 percent slopes.	Severe: 15 to 60 percent slopes.
Severe: ponded	Severe: ponded	Severe: ponded	Severe: ponded.
Severe: marshy	Severe: marshy	Severe: marshy	Severe: marshy.
Moderate: seasonal wetness	Slight: seasonal wetness	Slight	Moderate: seasonal wetness.
Severe: 5 to 15 percent slopes	Moderate: seasonal wetness	Moderate: 5 to 15 percent slopes.	Moderate for tents; moderate or severe for trailers: 5 to 15 percent slopes.
Severe: 15 to 30 percent slopes	Severe: 15 to 30 percent slopes; seasonal wetness.	Severe: 15 to 30 percent slopes.	Severe: 15 to 30 percent slopes.

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one or more cycles of erosion, these materials may have been highly weathered and leached at the time they were deposited.

Plant and animal life

Before the county was settled, the native vegetation had a major influence on the development of the soils. Although little is known about the effects of microorganisms, earthworms, larvae, and other forms of animal life, the activities of these animals were important in the cycle of decay and regeneration of plants.

The settlers found a dense forest that consisted mainly of hardwoods. Oaks were dominant in most parts of the county. Yellow-poplar, sweetgum, blackgum, holly, hickory, maple, dogwood, loblolly pine, pond pine, and Virginia pine also were important, but there were probably few pure stands of pine before the county was settled. The fairly pure stands of pine that exist today, particularly of loblolly pine, are generally in areas that were once cleared and cultivated.

Most hardwoods use large amounts of calcium and other bases if they are available. Soils that are normally high in bases remain so under a cover of deciduous trees because, in large part, the bases are returned to the soil each year. When the leaves fall and then decompose, the bases reenter the soil and are again used by plants.

The soils in Queen Annes County, however, have never been very high in bases; consequently, they are acid even under a cover of hardwoods. Soils that are strongly acid and low in fertility are better suited to pines than to most hardwoods. Pines do not require large amounts of calcium and other bases, and their needles do little to restore fertility to the soil.

As agriculture developed in the county, man became an important factor in the development of the soils. The clearing of the forests, cultivation in some areas, introduction of new kinds of crops and other plants, and improvements in drainage have affected development of the soils and will affect their development in the future.

The most important changes brought about by man are (1) mixing the upper horizons of the soil to form a plow layer; (2) tilling sloping soils, which has resulted in accelerated erosion; and (3) liming and fertilizing to change the content of plant nutrients, especially in the upper horizons. Generally, the most obvious change in the vegetation has been the loss of native plants, for only a small part of the county remains wooded today. In addition, there has been a notable increase in the number of pines as compared to the number of hardwoods.

Parent material

The parent material of the soils of this county consisted of sediments transported mainly by water, though part of it probably was transported by wind, and part by ice floes carried by glacial meltwater. Some of the sediments were the size of clay particles, but others were as large as pebbles. In places there were cobbles and small to fairly large stones.

The stones and larger pebbles must have been transported by ice during the retreats of some of the last glaciers. The Eastern Shore of Maryland was not glaciated, but glaciers once extended into northern Pennsylvania. Fragments of ice containing clay, gravel, and a few stones must have floated down the rivers. As the ice floes drifted southward, they melted and dropped sediments in the shallow sea. The areas in which sediments were dropped later emerged from the sea to form the Delmarva Peninsula, of which Queen Annes County is a part.

It is likely that the soil material in marshes and other low-lying areas consists of sediments that were recently deposited in shallow salt water. These sediments were elevated to sea level, either by slow uplift of the land or by fluctuations in the level of the sea and of Chesapeake Bay, or perhaps by both.

The texture of the soils is directly related to the texture of their parent material. Soils of the Galestown, Klej, Lakeland, and Plummer series, for example, developed in coarse-textured materials consisting chiefly of silica sand and partly of clay and, in some places, silt. There is some evidence, however, that their parent material, particularly that of the Galestown and Lakeland soils, was reworked by wind or by water, or both, between the time it was deposited and the time required for the soils to develop. The Galestown soils occur, in part, on old alluvial terraces along major streams of the county, notably adjacent to the southern or eastern bank of the Chester River. The Lakeland soils more commonly occur on formations that appear to be old wind-worked dunes.

Over the largest part of the county, the sediments that make up the parent material of the soils consist mainly of sand, but there is a significant amount of silt or clay, or both. In places these materials were stratified and were of differing texture in alternate layers. Soils of the Fallsington, Pocomoke, Sassafras, and Woodstown series developed in this kind of material.

The Butlertown, Matapeake, Mattapex, Bertie, Othello, and Portsmouth soils developed in a mantle of silt. This material appears to be loess that probably was blown from glaciated areas to the north. In places where the mantle was 36 to 40 inches thick and occurred unconformably on sandy materials, the soils that developed are of the Matapeake, Mattapex, Bertie, Othello, and Portsmouth series. In places where the mantle was thicker and, below the soil profile, consisted of unchanged silt, the resulting soils are of the Butlertown series and, in part, of the Matapeake series.

The finest textured sediments consisted chiefly of clay and silty clay but partly of fine and very fine sand. Soils of the Bayboro, Bladen, Elkton, and Keyport series developed in this kind of sediment.

In this county there are also several kinds of sediments that have been deposited recently. Soils of the Bibb and Johnston series are forming in recent deposits of alluvium on flood plains; Mixed alluvial land, a miscellaneous land type, consists of variable alluvium that has been recently deposited; Tidal marsh consists of recently deposited sediments, mostly clays, that have been influenced by salt water and the action of tides; Coastal beaches are water-deposited and wave-worked sands; and Swamp consists of unclassified sediments that are permanently waterlogged.

More than one kind of soil commonly develops in the same general kind of parent material. Thus, it is evident that factors other than parent material have influenced the kinds of soils that have developed in the county.

Topography

Queen Annes County is entirely within the Atlantic Coastal Plain. Most of the county is undulating or gently sloping, though some rather large areas are nearly level, a considerable acreage is fairly strongly sloping, and small areas are steep or very steep. Most slopes are smooth, but some are complex and hummocky and have small sinks or depressions. Slopes generally range between 2 and 5 percent, though in many places they are as much as 15 percent and in a few areas are 30 percent or more. The steeper slopes generally are breaks above drainageways. They occupy only a little more than 1 percent of the county.

Local differences in elevation normally are only a few feet. In several areas, however, there are differences of as much as 60 feet to the mile. The highest elevations are in the central part of the county; the highest point, about 1 mile northwest of Starr, is 87 feet above sea level.

The county slopes mainly toward Chesapeake Bay to the west, but an important part slopes toward Tuckahoe Creek to the east. Marshes in the county are approximately at sea level.

The undulating relief contributes to the moderately good or good drainage in most of the county. In the more nearly level areas, however, water moves slowly through many of the soils and increases the problem of drainage.

Time

Geologically, the deposits of soil materials in the county range from very young, or immature, to fairly old. The most recent, or Holocene, deposits are those on alluvial flood plains and in marshy areas affected by tides. In such areas soil material is still being added from year to year when the areas are flooded. Somewhat older, geologically, are the sands and the silty deposits of loess, which are probably of Pleistocene age. Most of the deposits in the county are probably of Miocene age, but some may be of Pliocene age (*7, 9*).

Time accounts for many of the differences among soils. In steep areas, for example, no well-defined horizons have had time to develop in the soils, because the soil material has been removed by geologic erosion almost as rapidly as it was deposited. On the other hand, some soils that formed in material deposited fairly recently show definite and, presumably, mature development. These soils are in nearly level areas, where there has been little or no geologic erosion, and the products of the soil-forming processes have remained in place as components of genetic soils.

Interrelationships of Soil Series

In table 18 the soil series of the county are grouped to show relationships in position, parent material, and drainage. Most of the soils are on uplands or terraces, but some are on flood plains or bottom lands. The texture of the parent material varies widely. Many of the soils are poorly or very poorly drained.

Soils of the uplands and terraces.—Although the soils on uplands and on terraces are in two different topographic positions, this difference does not affect the use and suitability of the soils and, in itself, does not affect the classification and naming of soils. Soils of some series, such as the Galestown and Sassafras, are on both uplands and terraces.

The soils on uplands have developed in place from the underlying parent material. Those on terraces have developed in very old material that was deposited by streams and generally is sandy. The soils on uplands and terraces occupy about 93 percent of the county.

Soils of the flood plains or bottom lands.—The flood plains or bottom lands consist of areas where soil material has been deposited only recently when streams overflowed their banks. The areas are still subject to flooding. Some of them are flooded only occasionally, but others are flooded every year or several times a year.

The floodwaters have left deposits of silt and sand, and in places there are deposits of clay or gravel. In most

TABLE 18.—*Soil series arranged to show relationships in position, parent material, and drainage*

SOILS OF UPLANDS AND TERRACES

Parent material	Somewhat excessively or excessively drained	Well drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
Sand and loamy sand	Galestown Lakeland		Klej	Klej	Plummer	
Sand, silt, and clay		Sassafras Downer	Woodstown		Fallsington	Pocomoke.
Thick deposit of silt [1]		Matapeake	Butlertown			
Thick mantle of silt [2] over sand		Matapeake	Mattapex	Bertie	Othello	Portsmouth.
Clay or silty clay			Keyport		Elkton Bladen	Bayboro.

SOILS OF FLOOD PLAINS OR BOTTOM LANDS

Parent material	Somewhat excessively or excessively drained	Well drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
Sand, silt, and clay					Bibb	Johnston.

[1] Mantle that is thick enough for soil to develop entirely within it and that is more or less unchanged silt below the profile.

[2] Mantle of silty material that generally is no thicker than 36 to 40 inches.

places the material in the deposits is of many different textures, but in some areas the texture is uniform. The material does not show much soil development. In places there has been some development of a surface layer, but there is no horizon of clay accumulation.

The soils of the flood plains are not extensive in this county. They make up about 4.4 percent of the total acreage. The remaining 2.6 percent of the county, other than the acreage occupied by uplands and terraces, consists of areas of Tidal marsh, Swamp, and Coastal beaches. These areas are not included in this section, because they do not have a developed soil profile.

Morphology of Soils

In most of the soils of the county, morphology is expressed by evident horizons. Little horizonation is shown, however, in young alluvial soils and in soils that consist chiefly of sand or loamy sand.

The differentiation of horizons in the soils is the result of one or more of the following processes: (1) Accumulation of organic matter, (2) leaching of carbonates and of salts more soluble than calcium carbonate, (3) chemical weathering, chiefly by hydrolysis, of the primary minerals of the parent material into silicate clay minerals, (4) translocation of the silicate clay minerals, and probably of some silt-sized particles, from one horizon to another, and (5) chemical changes (oxidation, reduction, and hydration) and transfer of iron.

In almost all soils of the county, several of these processes have been active in the development of horizons. For example, the interaction of the first, second, third, and fourth processes is reflected in the strongly expressed horizons of the Sassafras soils, and all five processes have been active in the development of the moderately well drained Keyport and Woodstown soils. Only the first and fifth processes have had any marked effect on the Bibb, Johnston, and Plummer soils. In most soils, however, the second process, the leaching of carbonates and salts, must have taken place in the soil materials before they were deposited, and some of the other processes may have been active.

Some organic matter has accumulated in all the soils to form an A1 horizon. Through tillage, the material in this horizon, however, has been mixed with materials from some of the underlying horizons. The A1 horizon has thus lost its identity and become a part of an Ap horizon, or plow layer. The amount of organic matter varies in the different soils and ranges from very low to very high. The Galestown and Lakeland soils all have a weak A1 horizon that contains little organic matter. Bayboro, Johnston, Pocomoke, and Portsmouth soils have a prominent A1 horizon in which there is more than 15 percent organic matter in places.

There have been few detailed studies of the clay mineralogy of the soils on the Eastern Shore of Maryland. The soil material in this area, however, consists of sediments that have been deposited by the Susquehanna and other rivers. These sediments originated in many parts of the Atlantic watershed. Thus, the composition and the origin of the clay minerals in the present soils is extremely variable. In such soils as the Sassafras and some of the other better oxidized, older soils, kaolinite is probably one of the chief clay minerals.

The translocation of silicate clay minerals has contributed strongly to development of horizons in many of the soils. Silicate clay minerals have been partly removed from the A1 and A2 horizons and partly immobilized in a Bt horizon. This is characteristic of the Bayboro, Bladen, Downer, Elkton, Butlertown, Fallsington, Galestown, Keyport, Bertie, Matapeake, Mattapex, Othello, Portsmouth, Sassafras, and Woodstown soils. To a slight degree, it also is characteristic of the Klej and some other soils that do not have a distinct textural B horizon.

The reduction and transfer of iron has occurred to some degree in all the soils that have impeded drainage. In the areas of naturally wet soils in Queen Annes County, this process, known as gleying, has been of great importance. The Bayboro, Bibb, Bladen, Elkton, Fallsington, Johnston, Othello, Plummer, Pocomoke, and Portsmouth soils have been affected by gleying.

Iron that has been reduced in areas where the soil is poorly aerated generally becomes mobile and may be removed from the soil entirely. In the soils of this county, however, iron has moved either within the horizon where it originated or to another nearby horizon. Part of this iron may become reoxidized and segregated to form the yellowish-brown, strong-brown, or yellowish-red mottles that indicate impeded drainage and are common in a gleyed horizon.

When silicate clay forms from primary minerals, some iron generally is freed as hydrated oxide. Depending upon the degree of hydration, these oxides are more or less red. Even a small amount of the oxide will cause the subsoil to have a reddish color. Iron oxide colors the subsoil, even where there has not been enough accumulation of clay minerals to form a textural, or Bt, horizon.

A profile that is representative for each soil series in the county is described in detail in the subsection "Detailed Descriptions of Soil Profiles."

Classification of the Soils

Soils are classified so that we may more easily remember their significant characteristics. Classification enables us to assemble knowledge about soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to management and manipulation. First through classification, and then by the use of soil maps, we can apply our knowledge of soils to specific tracts or parcels of land.

Soils are placed in narrow categories that are used in detailed soil surveys so that knowledge about the soils can be organized and applied in managing farms, fields, and woodlands; in developing suburbs; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

Two systems of classifying soils are now in general use in the United States. One of these is the 1938 system (*2*) with later revisions. The other is a completely new system (*8, 12*) that was placed in general use by the Soil Conservation Service in 1965. In this report the newer system is emphasized, but the placement of soils in the older system is also given (see table 19).

Under the new system, all soils are placed in six categories. Beginning with the most inclusive the six categories are the order, the suborder, the great group, the subgroup, the family, and the series. In this system the criteria used as bases for classification are observable or measurable properties. The properties are so chosen, however, that soils of similar origin are grouped together.

In the 1938 system of classification, with later revisions, soils are placed in six categories. In the broadest category, soils are classified in three orders. The next two categories—the suborder and the family—have never been fully developed and, as a consequence, have not been much used in the past. More attention has been given to lower categories: the great soil group, the soil series, and the soil type. The soil type is not a category in the new system.

In table 19, each soil series in Queen Annes County is placed in its family, subgroup, suborder, and order of the new classification system, and in its great soil group and order of the older system.

In the broadest category there are 10 orders recognized, but only three of these are represented in Queen Annes County. These are the Entisols, the Inceptisols, and the Ultisols.

Entisols are mineral soils that have been only slightly modified from the geologic material in which they have formed. In Queen Annes County the principal modification is a weakly developed A1 horizon.

Inceptisols (from the Latin *inceptum*, or beginning) are mineral soils in which horizons have started to develop. At the current stage of their development, these soils are not yet in equilibrium with their environment. In this county the Johnston soils are Inceptisols that have a well-developed, very dark colored A horizon.

Ultisols (from the Latin *ultimus*, or last) are strongly weathered or strongly developed soils. In Queen Annes County, these are the most common soils. They range from well drained to very poorly drained. Ultisols commonly represent advanced stages in soil development in which the processes have not been halted by lack of weatherable minerals in the geologic materials or by aberrations in the environment.

All the Entisols in this county are in the suborder Psamments (from the Greek *psammos*, or sand) and are dominantly very sandy throughout. In the Psamments are the two great groups, Aquipsamments and Quarzipsamments. The Aquipsamments are very sandy soils that are wet much of the time and are dominantly gray in color. The Quarzipsamments are very sandy soils that consist of 95 percent or more quartz or other normally insoluble minerals; they range from moderately wet to dry.

Typic Aquipsamments are wet, gray, very sandy soils that are saturated with water for part of the year. They have a weakly developed A1 horizon that is somewhat darker gray than the soil material beneath the A horizon. The Plummer soils are in this subgroup.

Typic Quarzipsamments consist primarily of quartz sand and may be saturated with water, but only for brief periods. They are not dominantly gray but are not particularly bright colored. They have a weakly developed A1 horizon. Their natural drainage is excessive. The Lakeland soils are in this subgroup.

Aquic Quarzipsamments are like Typic Quarzipsamments but have mottles with gray colors within 40 inches of the surface. They are naturally saturated with water for at least a brief part of the year, and they have a seasonally fluctuating water table. The Klej soils are in this subgroup.

In Queen Annes County, all the Inceptisols are in the suborder Aquepts, which are dominantly gray in color and are wet much of the time. There are two great groups under the Aquepts, the Normaquepts and the Humaquepts. The Normaquepts are the normal great group of the suborder, and the Humaquepts are aberrant in having an A horizon dominated by humus or organic matter.

Cumulic Normaquepts have a light-colored A horizon and a weakly developed B horizon that shows no evidence of clay accumulation. In a typical profile the organic-matter content decreases irregularly with depth. The Bibb soils are in this subgroup.

Typic Humaquepts have a thick, very dark gray or black A1 horizon over gray soil material. They are very poorly drained and are wet most of the time. The Johnston soils are in this subgroup.

In Queen Annes County the Ultisols are in the suborders Aquults and Udults. The Aquults have a horizon of clay accumulation that is dominantly gray, and they are wet and poorly drained. The Udults also have a horizon of clay accumulation, but they are not very wet or poorly drained. In the Udults at least a part of the Bt horizon (the horizon of clay accumulation) is brighter colored than the Bt horizon in the Aquults; it is dominantly not gray but has some higher chroma of yellow, brown, or red.

In this county the suborder Aquults is divided into the great groups Ochraquults and Umbraquults. The former have a relatively light colored A horizon, and the latter have a very dark gray or black A1 horizon.

Typic Ochraquults are naturally saturated with water for part of the year. They have a light-colored A horizon and a horizon of clay accumulation that is dominantly gray. The Bladen, Elkton, Fallsington, and Othello soils are in this subgroup.

Typic Umbraquults differ from Typic Ochraquults in having a very dark gray or black A1 horizon, or Ap horizon if plowed to a depth of 10 inches. The Bayboro, Pocomoke, and Portsmouth soils are in this subgroup.

The suborder Udults is divided in Queen Annes County into the great groups Normudults and Fragiudults. The Normudults are the normal soils of the suborder. They have a horizon of clay accumulation that is dominantly bright-colored reddish brown, strong brown, or yellowish brown. They have textures that are loamy fine sand or coarser in some part of the Bt horizon. The Fragiudults typically have a fragipan (a dense, brittle horizon) just beneath the horizon of clay accumulation.

Typic Fragiudults have a fragipan under a bright yellowish or reddish horizon of clay accumulation. There are no gray mottles (chroma of 2 or less) within the upper 10 inches of the horizon of clay accumulation. These soils also have a light-colored A horizon. The Butlertown soils are in this subgroup.

Alfic Normudults show no evidence of wetness. They have a horizon of clay accumulation with fairly bright

TABLE 19.—*Soil series classified according to the new and the old systems of classification*

Series	New classification				Old classification	
	Family	Subgroup	Suborder	Order	Great soil group	Order
Bayboro	Clayey, mixed, thermic	Typic Umbraquults.	Aquults	Ultisols	Humic Gley	Intrazonal.
Bertie	Fine loamy, mixed, thermic.	Aqualfic Normudults.	Udults	Ultisols	Low-Humic Gley (intergrading toward Red-Yellow Podzolic).	Intrazonal.
Bibb	Coarse loamy, mixed, acid, thermic.	Cumulic Normaquepts.	Aquepts	Inceptisols	Low-Humic Gley	Intrazonal.
Bladen	Clayey, mixed, thermic	Typic Ochraquults.	Aquults	Ultisols	Low-Humic Gley	Intrazonal.
Butlertown	Fine silty, mixed, mesic.	Typic Fragiudults.	Udults	Ultisols	Gray-Brown Podzolic (intergrading toward Red-Yellow Podzolic).	Zonal.
Downer	Coarse loamy, siliceous, mesic.	Alfic Normudults	Udults	Ultisols	Gray-Brown Podzolic (intergrading toward Regosol).	Zonal.
Elkton	Clayey, mixed, mesic	Typic Ochraquults.	Aquults	Ultisols	Low-Humic Gley	Intrazonal.
Fallsington	Fine loamy, siliceous, mesic.	Typic Ochraquults.	Aquults	Ultisols	Low-Humic Gley	Intrazonal.
Galestown	Sandy, siliceous, mesic	Psammentic Normudults.	Udults	Ultisols	Sol Brun Acide	Intrazonal.
Johnston	Fine loamy, mixed, acid, thermic.	Typic Humaquepts.	Aquepts	Inceptisols	Humic Gley	Intrazonal.
Keyport	Clayey, mixed, mesic	Paraquic Normudults.	Udults	Ultisols	Red-Yellow Podzolic (intergrading toward Gray-Brown Podzolic).	Zonal.
Klej	Sandy, siliceous, acid, mesic.	Aquic Quarzipsamments.	Psamments	Entisols	Regosol	Azonal.
Lakeland	Sandy, siliceous, acid, thermic.	Typic Quarzipsamments.	Psamments	Entisols	Regosol	Azonal.
Matapeake	Fine silty, mixed, mesic.	Alfic Normudults	Udults	Ultisols	Gray-Brown Podzolic (intergrading toward Red-Yellow Podzolic).	Zonal.
Mattapex	Fine silty, mixed, mesic.	Aqualfic Normudults.	Udults	Ultisols	Gray-Brown Podzolic (intergrading toward Red-Yellow Podzolic).	Zonal.
Othello	Fine silty, mixed, mesic.	Typic Ochraquults.	Aquults	Ultisols	Low-Humic Gley	Intrazonal.
Plummer	Sandy, siliceous, acid, thermic.	Typic Aquipsamments.	Psamments	Entisols	Regosol	Azonal.
Pocomoke	Fine loamy, siliceous, thermic.	Typic Unbraquults.	Aquults	Ultisols	Humic Gley	Intrazonal.
Portsmouth	Fine loamy, siliceous, thermic.	Typic Umbraquults.	Aquults	Ultisols	Humic Gley	Intrazonal.
Sassafras	Fine loamy, siliceous, mesic.	Alfic Normudults.	Udults	Ultisols	Gray-Brown Podzolic (intergrading toward Red-Yellow Podzolic).	Zonal.
Woodstown	Fine loamy, siliceous, mesic.	Paraquic Normudults.	Udults	Ultisols	Gray-Brown Podzolic (intergrading toward Red-Yellow Podzolic).	Zonal.

colors; that is, with a chroma of less than 6 in at least some part, whereas Typic Normudults, which are not represented in Queen Annes County, have a horizon of clay accumulation with a chroma of 6 or more in all parts, and they are definitely brighter in color than Alfic Normudults. The Alfic Normudults are well drained. The Downer, Matapeake, and Sassafras soils are in the Alfic subgroup.

Aqualfic Normudults are like Alfic Normudults, but they have some gray mottling with a chroma of 2 or less within the upper 20 inches of their horizon of clay accumulation. They are moderately well drained to somewhat poorly drained. The Bertie and Mattapex soils are in this subgroup.

Paraquic Normudults are like Typic Normudults, which have brighter colors than Alfic Normudults. Paraquic Normudults, however, have some gray mottles with a chroma of 2 or less between 10 and 20 inches below the upper boundary of the horizon of clay accumulation, but not within the upper 10 inches. They are moderately well drained. The Keyport and Woodstown soils are in this subgroup.

Psammentic Normudults are like Typic Normudults except that they have a texture of loamy fine sand or coarser in some part of the horizon of clay accumulation. They have a higher chroma than the Aquults—dominantly yellow, brown, or red. The Galestown soils are in this subgroup.

Families of soils within subgroups are differentiated on the basis of texture, coarse fragments, mineralogy, and mean annual soil temperature, and sometimes some additional factors, such as acidity. Queen Annes County is approximately on the indefinite boundary between the thermic (warm or hot) and the mesic (temperate) soil-temperature zones. For this reason, some of the soils of the county have been placed in thermic families and some in mesic families. Table 19 shows the family classification of the soil series in Queen Annes County.

Placement of soil series in the new classification system is still somewhat tentative. Placement of some series, particularly into families, may change as more is learned about the soils.

Detailed Descriptions of Soil Profiles

This subsection describes in detail a profile of each soil series mapped in Queen Annes County. The individual profile described is as nearly representative of the series, as it occurs in Queen Annes County, as it has been possible to find. In most cases this profile also represents the modal, or central, concept of the series as defined by the National Cooperative Soil Survey.

In addition to a detailed profile description, there are notes or statements on each of the following items or accessory characteristics for the soils in each series: The range in characteristics of the series as it occurs in Queen Annes County; differences from similar or competing series in the county; differences from other soils developed in the same kind of material in the county, if any; the natural vegetation; the principal uses of the soils; and the extent and importance of the soils in the county.

Bayboro series

The soils of the Bayboro series are very poorly drained. They typically have a thick, black A horizon that is high in organic-matter content and that is underlain by a gray, prominently mottled, highly clayey B2tg horizon that is very slowly permeable.

Following is a profile of Bayboro silt loam in a slightly depressional, heavily wooded area, about 1½ miles north of Templeville and just east of Bear Pen Road:

O1—½ inch to 0, matted, slightly decomposed leaves from hardwoods.

A1—0 to 12 inches black (10YR 2/1) silt loam; weak, medium, granular structure; friable when moist, sticky and slightly plastic when wet; roots abundant; extremely acid; clear to abrupt, smooth boundary. 10 to 14 inches thick.

B1g—12 to 17 inches, very dark gray (10YR 3/1) silty clay; moderate, coarse, blocky structure; firm when moist, sticky and plastic when wet; roots abundant in the larger old root channels, few elsewhere; channels lined with dark yellowish-brown (10YR 4/4) silt or clay; extremely acid; abrupt, irregular boundary. 4 to 8 inches thick.

B2tg—17 to 33 inches, matrix of gray (5Y 5/1) to bluish-gray clay or fine silty clay with common, medium, prominent mottles of reddish yellow (7.5YR 6/6); moderate, coarse, blocky structure; firm when moist, very sticky and plastic when wet; few roots; many pores; abundant old root channels that are very fine to coarse (as large as 2 inches in diameter); pores and channels filled with very dark gray (5Y 3/1) clay or silty clay; almost continuous, very thin to thick, very dark gray (5Y 3/1); flows and coatings of clay that are on and around aggregates and give block surfaces a variegated or almost striped appearance of gray and very dark gray; extremely acid; gradual, smooth boundary. 15 to 28 inches thick.

Cg—33 to 50 inches +, gray or light-gray (5Y 6/1) to light bluish-gray clay or fine silty clay with abundant, fine, prominent mottles of strong brown (7.5YR 5/8); massive (structureless) to very weak, irregular, blocky structure; firm when moist, very sticky and plastic when wet; no visible roots, but some old large root channels that are filled with very dark gray (5Y 3/1) clay or fine silty clay; extremely acid.

In this county the texture of the A horizon is silt loam. The B1g horizon ranges from heavy silt loam to silty clay. The B2tg horizon and the Cg horizon are clay or silty clay. In places there is a coarser textured IICg horizon within 4 to 6 feet of the surface. The A1 horizon has very low bulk density and very high liquid limit because of the organic nature of the silt in this horizon. The solum ranges from slightly less than 30 inches to nearly 60 inches in thickness.

Hue ranges from 10YR to 5Y and neutral. The A horizon generally has a value of 2 and a chroma of 0 or 1 or, in some places, 2. In the matrix of the B horizon, the value ranges from 3 to 6 but is most commonly 5, and the chroma is 0 or 1 or, in places, 2. In some places these matrix colors have a faint bluish or greenish cast. Mottles in the B and C horizons have a hue mostly of 7.5YR or 10YR, a value of 4 to 6, and a chroma of 4 to 8, but in places where the matrix chroma is 2, there may be faint mottles that have a chroma of 0 or 1. In some areas of Bayboro soils, mottles are lacking in the B or C horizon or, in some places, in the entire profile.

Structure ranges from very weak to moderate and generally is strongest in the B2tg horizon, which normally

has coarse blocky structure. This horizon, when wet, is plastic and nearly everywhere is very sticky. Unless the Bayboro soils have been limed, they are very strongly acid or extremely acid. In a dry soil the value of the B horizon generally is one unit higher than that given, which is for a moist B horizon. However, the A horizon has the same value, moist or dry.

The Bayboro soils are similar to the Portsmouth and Pocomoke soils in color and degree of wetness, but they have a finer textured B2tg horizon, which is silty clay loam in the Portsmouth soils in this county and is sandy clay loam in the Pocomoke soils. The Bayboro soils formed in the same kind of clayey sediments as the Keyport and Elkton soils, but they are much more poorly drained than the Keyport soils and have a black instead of a gray A1 horizon. In addition, Bayboro soils are more poorly drained than Elkton soils, which are wetter than Keyport soils.

The Bayboro soils have a total area of less than 1,300 acres in Queen Annes County. Only a few acres are cultivated, principally to corn and soybeans. Most areas remain wooded and are in stands consisting mainly of water-tolerant oaks, blackgum, red maple, and sweetbay. In some places there are pond and loblolly pines. These soils are difficult and expensive to clear and to drain for most agricultural uses and other purposes.

Bertie series

The soils of the Bertie series are very silty and somewhat poorly drained. These soils typically have a light-colored A horizon and weakly to moderately expressed B21t and B22t horizons that are mottled with gray colors in the upper 10 inches and that are rather slowly permeable.

Following is a profile of Bertie silt loam in a nearly level cultivated area just west of U.S. Highway No. 213, about 2 miles north of its intersection with U.S. Highway No. 50:

Ap—0 to 8 inches, dark grayish-brown (2.5Y 4/2) silt loam; weak, medium, granular structure; friable when moist, and slightly plastic when wet; roots plentiful; medium acid (limed); clear, smooth boundary. 7 to 12 inches thick.

A2—8 to 11 inches, light yellowish-brown (2.5Y 6/4) silt loam; weak, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots common; strongly acid; clear, smooth boundary. 3 to 5 inches thick.

B1—11 to 15 inches, yellowish-brown (10YR 5/4) heavy silt loam; very weak, medium, subangular blocky structure; firm in place, friable when removed; sticky and slightly plastic; roots fairly common; very strongly acid; clear, smooth boundary. 3 to 6 inches thick.

B21t—15 to 25 inches, light olive-brown (2.5Y 5/6) heavy silt loam, common, medium, distinct mottles of light gray (2.5Y 7/2) and yellowish brown (10YR 5/6); weak, medium and coarse, subangular blocky structure; firm when moist, sticky and plastic when wet; few roots; thin, irregular coatings of yellowish-brown clay (10YR 5/4); very strongly acid; gradual, smooth boundary. 8 to 20 inches thick.

B22t—25 to 34 inches, light olive-brown (2.5Y 5/4) light silty clay loam with common, medium, distinct mottles of light gray (10YR 7/1) and common, fine, prominent mottles of strong brown (7.5YR 5/6); weak, medium, blocky and subangular blocky structure; firm when moist, sticky and plastic when wet; very few roots; distinct to prominent, irregular coatings of yellowish-brown clay (10YR 5/4); abrupt, smooth boundary. 8 to 15 inches thick.

IIC1g—34 to 49 inches, light brownish-gray (2.5Y 6/2) light sandy loam with common, coarse, distinct mottles of light yellowish brown (10YR 6/4) and common, medium, prominent mottles of strong brown (7.5YR 5/8); stratified with very thin lenses of light brownish-gray (10YR 6/2) sand; very friable when moist, slightly sticky and nonplastic when wet; very few roots; extremely acid; gradual, smooth boundary. 12 to 18 inches thick.

IIC2g—49 to 60 inches +, light-gray (N 7/0) sand with horizontal streaks of light brownish gray (10YR 6/2); single grain (structureless); loose; no roots; extremely acid.

In Queen Annes County the texture of the A horizon is only silt loam. The B21t and B22t horizons, which are distinctly but not prominently finer textured than the A horizon, are heavy silt loam or very light silty clay loam. They have some distinct to prominent coatings of clay and have a clay content of 18 to 35 percent. In places there is a C horizon of silt loam that is thin and is abruptly underlain by a IIC horizon of coarser texture. The solum ranges from about 30 to nearly 50 inches in thickness, and the depth to unconformable coarser material generally occurs within the same range but in some places is slightly greater.

In undisturbed areas there is an A1 horizon, as much as 3 inches thick, and an A2 horizon that is somewhat thicker than the one in the profile described. The hue of the solum is 10YR or 2.5 Y, or both, in the same profile. The A1 horizon generally has a value of 3 and a chroma of 1 or 2. In value and chroma, the Ap horizon generally is one unit higher than the A1 horizon. The value of the A2 horizon is 5 or 6, and the chroma is 3 or 4. The matrix in the B21t and B22t horizons has a value of 5 or 6 and a chroma that is normally 4 but may be 6 in some part. Mottling is the same as in the matrix or redder in hue, is 5 to 7 in value, and is 1 to 8 in chroma. In most mottled horizons the mottles have a chroma both lower and higher than that of the matrix. In the upper 10 inches of the profile, mottling has chroma of 2 or less. The C horizon generally is grayer than the solum and may be variously mottled. The values of a dry soil generally are one unit higher than those given, which are for a moist soil.

Structure is weak in most places but may be moderate in the B21t and B22t horizons. These horizons are firm in place, generally are sticky and plastic but not highly so, and have moderately slow permeability when saturated. The Bertie soils are strongly acid to extremely acid, unless they have been limed.

In Queen Annes County, no other soils are similar to the Bertie soils in color or degree of wetness. The somewhat poorly drained Bertie soils occur on level to gently sloping uplands and formed in silty material over older, coarser textured sediments. Formed in the same kind of material were the well drained Matapeake soils, the moderately well drained Mattapex soils, the poorly drained Othello soils, and the very poorly drained Portsmouth soils.

A further distinction between the Bertie and Mattapex soils and between the Bertie and Othello soils is the depth to mottling. The Bertie soils are not mottled in the upper part of the B horizon, but they have mottles with chroma of 2 or less in the lower B horizon, and the mottling generally extends upward to within 10 to 15 inches

of the surface. The Mattapex soils are not mottled in the upper 10 inches of their Bt horizon. The Othello soils are strongly gleyed, have a matrix color with chroma of 2 or less throughout, and generally are distinctly or prominently mottled in all horizons below the A1 or the Ap horizon.

In Queen Annes County the Bertie soils are of minor extent. Most of their acreage is used for crops, chiefly corn and soybeans. The natural vegetation consists mainly of water-tolerant hardwoods and, in some places, loblolly pine.

In this county the Bertie soils occur closely with the Othello soils and are mapped only in groups of undifferentiated Bertie and Othello silt loams.

Bibb series

In the Bibb series are poorly drained soils that occur on flood plains of streams. They have a dark-gray A horizon and a lighter gray B horizon that is prominently mottled but shows no evidence of clay accumulation. The soils developed in recent deposits of silty alluvium that have an uneven distribution of organic matter with depth.

Following is a profile of Bibb silt loam in a level wooded area on a flood plain, about 50 feet west of Bloomingdale Road and about 1½ miles southwest of its intersection with U.S. Highway No. 301:

O1—2 inches to 0, litter of leaves from mixed hardwoods.

A11—0 to 5 inches, very dark gray (10YR 3/1) heavy silt loam; very weak, fine, granular structure; friable when moist, sticky and slightly plastic when wet; roots fairly plentiful; very strongly acid; gradual smooth boundary. 3 to 5 inches thick.

A12—5 to 9 inches, dark-gray (5Y 4/1) heavy silt loam with a few fine, prominent mottles of dark yellowish brown (10YR 4/4); very weak, very thin, platy structure; friable or slightly firm when moist, sticky and slightly plastic when wet; roots fairly plentiful; very strongly acid; gradual, smooth boundary. 5 to 8 inches thick.

Bg—9 to 37 inches, gray (5Y 5/1) silt loam with common, fine, prominent mottles of yellowish brown (10YR 5/4); massive (structureless) to very weak, coarse, blocky structure; friable when moist, slightly sticky and slightly plastic when wet; very few roots; extremely acid; abrupt, smooth boundary. 20 to 30 inches thick.

IICg—37 to 50 inches +, black (5Y 2/2) fine clay with common, coarse, prominent mottles of gray or light gray (5Y 6/1) and a few, fine, prominent mottles of brown (10YR 5/3); massive (structureless); firm when moist, sticky and very plastic when wet; no roots; appears to be organic clay deposited much earlier than the horizons above, and it may be the A horizon of a paleosol; extremely acid.

The Bibb soils in Queen Annes County have a silt loam surface layer. The Bg horizon is silt loam and typically is less than 18 percent clay and somewhat more than 15 percent fine to coarse sand. Normally, there is no C horizon. The IICg horizon may be almost any texture but most commonly is somewhat finer textured than the A and B horizons. The solum ranges from about 20 to nearly 50 inches in thickness, but it is 30 to 40 inches thick in most places. This range generally is the same as the depth to unconforming material.

Hues throughout the solum range from 10YR to 5Y or, in some places, neutral. The thin A11 horizon has a value of 3 or 4, and the A12 horizon a value of 4 or 5 or, in some places, 6. In cultivated areas the Ap horizon has a value of 4 or 5. In the B horizon the matrix has a value of 5 or 6. The chroma of the matrix generally is 2 or less throughout the solum, but in some places the chroma is 3 or 4 in the plow layer. Mottles have a hue mostly of 10YR or redder, a value of 3 to 6, and a chroma of 4 to 8. The 11Cg horizon is variable in color but generally is dominated by some value of gray. For a dry soil, the values of all horizons generally are one unit higher than those given, which are for a moist soil.

The solum has weak or very weak structures and generally is only slightly sticky or plastic when wet. Unless they have been limed, the Bibb soils are strongly acid to extremely acid.

The Bibb soils formed in alluvium that recently accumlated on level or nearly level flood plains. In this county the only other soils on flood plains are the Johnston soils. Johnston soils are wetter than Bibb soils and have a thick, black A horizon. In wetness, color, and silt content, the Bibb soils are similar to the Othello soils, which occur on upland flats. However, the Othello soils have a Bt horizon in which clay has accumulated, whereas the Bibb soils do not.

The Bibb soils occupy only a few hundred acres in this county and are of little importance. Just a few acres are used for corn and other cultivated crops or for improved pasture, and there is a little grazing on unimproved pasture. The native trees are mainly red maple, holly, gums, and water-tolerant oaks.

Bladen series

Soils of the Bladen series are poorly drained and very slowly permeable. These soils typically have a grayish A horizon and a gray Bt horizon that is very high in content of clay and is prominently mottled.

Following is a profile of Bladen silty clay loam in a savannalike area about one-half mile south-southwest of Grasonville:

A1—0 to 6 inches, dark-gray (5Y 4/1) silty clay loam; very weak, fine, granular structure; firm when moist, sticky and plastic when wet; roots abundant; very strongly acid; clear, wavy boundary. 3 to 7 inches thick.

A2g—6 to 11 inches, grayish-brown (2.5Y 5/2) silty clay loam with common, medium, faint mottles of light gray (2.5Y 7/2) and a few, fine, distinct mottles of brown (7.5YR 4/4); weak, fine, granular structure; firm when moist, sticky and plastic when wet; roots plentiful; very strongly acid or extremely acid; clear, wavy boundary. 4 to 8 inches thick.

B1g—11 to 17 inches, olive-gray (5Y 5/2) fine clay loam with common, medium, prominent mottles of strong brown (7.5YR 5/8) and common, medium, faint mottles of light gray (5Y 7/1); weak, medium, blocky and subangular blocky structure; firm when moist, very sticky and plastic when wet; roots fairly common; some faint coatings of dark-gray (5Y 4/1) material, apparently silty; extremely acid; gradual, wavy boundary. 4 to 8 inches thick.

B21tg—17 to 29 inches, gray (5Y 5/1) clay with common, medium, prominent mottles of strong brown (7.5YR 5/8) and abundant, coarse, prominent mottles of yellow (2.5Y 7/6); weak, coarse, blocky structure; very firm when moist, extremely sticky and very plastic when wet; a very few roots; a few thick flows of dark-gray (5Y 4/1) clay; extremely acid; gradual, wavy boundary. 10 to 20 inches thick.

B22tg—29 to 44 inches, gray (5Y 5/1) clay with abundant, medium, prominent mottles of strong brown (7.5YR 5/8) and abundant, coarse, prominent mottles of yellow (2.5Y 7/8); weak, coarse, blocky structure; very firm when moist, extremely sticky and extremely plastic when wet; no roots; a few thick, prominent flows of olive (5Y 5/3) clay; extremely acid; abrupt, wavy boundary. 10 to 20 inches thick.

IICg—44 to 60 inches +, dark-gray (N 4/0) fine sandy clay with common, medium, distinct mottles of olive and olive yellow (5Y 5/3 and 6/8); massive (structureless); very firm when moist, very sticky and very plastic when wet; no roots; strongly acid.

In Queen Annes County the texture of the A horizon is silty clay loam. The B21tg and B22tg horizons are clay or silty clay; their clay content is more than 35 percent and averages about 50 percent. Typically, the solum ranges from 40 to more than 50 inches in thickness. The C horizon is almost invariably unconformable. It may or may not have a high content of clay, but it generally is 50 percent or more sand.

Hue in all horizons is mainly 5Y but ranges from 10YR to neutral. The A1 horizon may have a value of 3 or 4 but is thin. The Ap horizon has a value of 4 or 5. Below the A1 or Ap horizon, the matrix has a value generally of no more than 5 and a chroma ranging from 0 to 2. Although there may be some low-contrast mottling with grayish colors, it is typical of the Bladen soils that most mottling has a hue of 10YR or redder, a chroma of 6, or more commonly of 8, and a value mostly of 5 to 7. For all horizons, the values of a dry soil generally are one unit higher than those given, which are for a moist soil.

Structure is weak or very weak in all horizons and, in some places, appears massive, even in genetic horizons. The Bladen soils have the most sticky and most plastic Bt horizons of any of the soils in Queen Annes County. Bladen soils are very strongly acid or extremely acid in the solum unless they have been limed. In many places, however, the unconformable IICg horizon is less strongly acid than the solum.

In Queen Annes County the Bladen soils occur in level to depressional areas that generally are adjacent to salt water and are only slightly above sea level. These soils formed in highly clayey material underlain by generally coarser sediments. In some respects the Bladen soils are similar to the Elkton soils, but they characteristically contain more clay throughout the solum than the Elkton soils, they commonly have mottling of higher contrast, and on the average they have higher chroma and value than the Elkton soils.

The Bladen soils are inextensive and of little importance in Queen Annes County, and they are not used for crops. The natural vegetation consists mainly of wetland hardwoods, and there are some open areas of shrubs and coarse grasses.

Butlertown series

The soils of the Butlertown series are deep and silty, but they have a firm, brittle lower B horizon (fragipan) that restricts movement of moisture and penetration of roots. These soils are only moderately well drained.

Following is a profile of a Butlertown silt loam in a nearly level cultivated area about 1¾ miles north-northeast of Wye Mills:

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam or silt; moderate, fine to medium, granular structure; very friable when moist, slightly sticky and very slightly plastic when wet; roots abundant; slightly acid (limed); abrupt, smooth boundary. 10 to 12 inches thick.

B1—10 to 16 inches, light yellowish-brown (10YR 6/4) heavy silt loam; very weak, medium, subangular blocky structure; friable when moist, slightly plastic and slightly sticky when wet; roots plentiful; a few faint coatings of dark grayish-brown (10YR 4/2) silt; medium acid; gradual, wavy boundary. 4 to 7 inches thick.

B2t—16 to 34 inches, yellowish-brown (10YR 5/6) light silty clay loam; weak to moderate, medium and coarse, subangular blocky structure; friable or slightly firm when moist, sticky and slightly plastic when wet; roots fairly common; some prominent coatings and flows of dark yellowish-brown (10YR 4/4 or 3/4) clay; strongly acid; clear to abrupt, slightly wavy boundary. 12 to 20 inches thick.

Bx—34 to 49 inches, yellowish-brown (10YR 5/6) heavy silt loam with common to abundant, fine, distinct mottles of grayish brown (2.5Y 5/2) and light brownish gray (10YR 6/2); weak to moderate, thin, platy structure; moderately firm and distinctly brittle when moist, slightly sticky and slightly plastic when wet; a very few roots in upper part; distinct flows and coatings of brown to dark-brown (7.5YR 4/4) clay; strongly acid; gradual, wavy boundary. 10 to 20 inches thick.

C—49 to 60 inches +, yellowish-brown (10YR 5/6) silt loam or silt with abundant, fine to medium, distinct mottles of light brownish gray (10YR 6/2); single grain (structureless) to very weakly stratified; somewhat firm and brittle when moist, slightly sticky and very slightly plastic when wet; no roots; a few faint coatings or weak flows of yellowish brown (10YR 5/4) but only in upper few inches; strongly acid.

In this county the A horizon is mapped only as silt loam, but this includes 80 to 90 percent silt in some areas. The B2t and Bx horizons are heavy silt loam or light silty clay loam, and they have a clay content of more than 18 percent but generally less than 30 percent. The B2t horizon averages about 5 percent more clay than the Bx horizon and about 10 percent more clay than the A horizon. The C horizon is commonly as highly silty as the A horizon, but in places below a depth of about 50 inches, it contains some very thin strata of fine or very fine sand. In uneroded areas the solum normally ranges between 45 and 55 inches in thickness.

In undisturbed areas there is an A1 horizon 3 to 5 inches thick and an A2 horizon 4 to 6 inches thick. The hue generally is 10YR throughout the soil, but it may be 7.5YR in the matrix of the B2t horizon or in clay coatings. The A1 horizon has a value af 3 or 4 and a chroma generally of 2. In the Ap horizon, value is 4 or 5 and chroma is 2 or 3. The A2 and B1 horizons have a value of 4 to 6 and a chroma normally of 4. Color in the matrix of the B2t and Bx horizons has a value of 5 or rarely 6 and a chroma of 6 or rarely 8. In some places there is faint mottling in the lower part of the B2t horizon, but none in the upper 10 inches of that horizon. In the grayish mottling in the Bx and C horizons, chroma is 2 nearly everywhere but is 1 in a few places. Coatings and flows of clay have a value and a chroma of 3 or 4. For all horizons, values of a dry soil are commonly one unit higher than those given, which are for a moist soil.

Structure is mostly moderate and grades toward weak, but it may be somewhat stronger locally, particularly in the Bx horizon. In the fragipan the structure is distinctly platy, and there is only a faint indication of prismatic structure. The fragipan is not strongly expressed. Only the B2t horizon is fairly sticky when wet, and no horizon is significantly plastic. Unless these soils have been limed, they normally are strongly acid.

The Butlertown soils are the only soils in the county that have a distinctly expressed fragipan. They occur on level to moderately sloping uplands and formed in a mantle of acid silts and very fine sands over uncomformable coarser sediments. These coarser sediments occur at a depth sufficiently great that they apparently did not affect the development or morphology of the soil.

Formed in the same general kind of material as the Butlertown soils were the well drained Matapeake soils; the moderately well drained Mattapex soils, which are like the Butlertown soils in degree of wetness but do not have a fragipan; the somewhat poorly drained Bertie soils; the poorly drained Othello soils; and the very poorly drained Portsmouth soils. In Queen Annes County, however, only those Matapeake soils that are mapped as having a silty substratum formed in a silty mantle of such thickness as the Butlertown soils.

In this county the Butlertown soils are fairly extensive and are agriculturally important. They are suited to all the common crops and are widely used for crops and pasture. Only a relatively small acreage remains wooded. The natural vegetation consists almost entirely of mixed hardwoods, dominantly oaks. Loblolly pine occurs in some areas that have been cut over or previously cleared.

Downer series

The Downer series consists of deep, well-drained, very sandy soils. These soils have a thin B2t horizon that is only slightly finer in texture than the A horizon. The B horizon is much browner than the A horizon, and the C horizon is sandy and loose or very friable. The soils are readily permeable.

Following is a profile of Downer loamy sand in a nearly level cultivated area, about 1½ miles east of Roundtop Wharf:

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) loamy sand; very weak; fine and medium, granular structure; very friable when moist, nonsticky and nonplastic when wet; roots plentiful; strongly acid; abrupt, smooth boundary. 10 to 12 inches thick.

A2—10 to 18 inches, yellowish-brown (10YR 4/4) loamy sand; very weak, medium, granular structure; very friable when moist, nonplastic and nonsticky when wet; roots common; some Ap material in old root channels; strongly or very strongly acid; clear, smooth boundary. 6 to 8 inches thick.

B1—18 to 21 inches, yellowish-brown (10YR 5/6) sandy loam; very weak, medium, subangular blocky structure; very friable when moist, nonplastic and nonsticky when wet; a few roots; some Ap material in old root channels; very strongly acid; gradual, smooth boundary. 0 to 4 inches thick.

B2t—21 to 27 inches, dark-brown (7.5YR 4/4) heavy sandy loam; weak, medium and coarse, blocky and subangular blocky structure; friable or slightly firm when moist, sticky and slightly plastic when wet; very few roots; some thin, discontinuous clay coatings; strongly acid; gradual, smooth boundary. 5 to 8 inches thick.

B3—27 to 32 inches, dark-brown (7.5YR 4/4) sandy loam; very weak, medium and coarse, blocky structure; very friable when moist, slightly sticky and nonplastic when wet; very few roots; some traces of clay coatings in pores; strongly acid; gradual, smooth boundary. 0 to 6 inches thick.

C1—32 to 42 inches, strong-brown (7.5YR 5/6) loamy sand; single grain (structureless); loose or very friable when moist; a very few single roots; strongly to medium acid; diffuse boundary.

C2—42 to 60 inches +, yellow (10YR or 2.5Y 7/6) sand; single grain (structureless); loose; no roots; strongly acid.

In this county the texture of the A horizon is only loamy sand. The B2t horizon everywhere contains more clay than the other horizons of the profile, but typically the clay content in the B2t horizon is less than 18 percent. The B1 and B3 horizons, which are lacking in places, have less clay than the B2t horizon but have definitely more clay than either the A or the C horizon. The solum ranges from about 24 to nearly 40 inches in thickness.

In wooded and other undisturbed areas, the A1 horizon is as much as 3 inches thick. The hue of the A horizon is 10YR or 2.5Y. The A1 or Ap horizon generally has a value of 4 or 5 and a chroma of 2. The A2 horizon has a value of 4 to 6 and a chroma of 2 to 4. Hue in the B horizon is mainly 7.5YR but ranges from 10YR to 5YR. The B2t part of the B horizon is as red in hue as any other part and, in many places, is redder than the other horizons. Value in the Bt horizon is 4 or 5, and chroma is 4, 6, or rarely 8, but chroma is no greater than 4 in at least some part. Colors in the C horizon are much like those in the B horizon, though the value may be higher. For all horizons, the values of a dry soil may be one or two units higher than those given, which are for a moist soil.

The Downer soils occur on nearly level to moderately sloping or rolling interfluvial uplands and formed in sandy sediments containing only a rather small amount of silt and clay. These soils grade into the Galestown soils on the one hand and into the Sassafras soils on the other. Their range in color is much the same as that of the Galestown and the Sassafras soils. They have a Bt horizon that is more prominent than that in the Galestown soils, but their Bt horizon is not so thick, so fine in texture, or so sticky as that of the Sassafras soils. The Downer soils also have a thicker coarser textured A horison than the Sassafras soils.

The Downer soils are not extensive but are important in the county, and most of their acreage is cultivated. The principal crops are corn, soybeans, and various truck crops, especially sweetpotatoes. The natural vegetation is upland hardwoods, dominantly oaks. Cutover and second-growth areas may have some loblolly pine or, more commonly, some Virginia pine.

Elkton series

The soils of the Elkton series are poorly drained. These soils typically have a grayish to brownish A horizon. Their B21tg and B22tg horizons are high in clay content, are dominantly gray but distinctly or prominently mottled, and are slowly or very slowly permeable.

Following is a profile of Elkton silt loam in a nearly level wooded area about 1 mile south of Gouldtown Church:

O1—4 inches to 1 inch, litter of needles and other leaves 2 to 3 inches thick.

O2—1 inch to 0, mat of decomposed organic material. ½ inch to 2 inches thick.

A1—0 to 3 inches, very dark brown (10YR 2/2) silt loam; weak, coarse, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots abundant; extremely acid; clear, smooth boundary. 2 to 3 inches thick.

A2g—3 to 7 inches, gray (10YR 5/1) silt loam with common, medium, distinct mottles of brown or dark brown (10YR 4/3) and a few, fine, distinct mottles of strong brown (7.5YR 5/8); moderate, medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots plentiful; extremely acid; gradual, wavy boundary. 3 to 5 inches thick.

B1g—7 to 12 inches, gray (10YR 5/1) heavy silty clay loam with common, medium, distinct mottles of yellowish brown (10YR 5/6) and a few, fine, distinct mottles of strong brown (7.5YR 5/8); moderate, medium, subangular blocky structure; firm when moist, sticky and slightly plastic when wet; roots common to plentiful; extremely acid; gradual, wavy boundary. 4 to 6 inches thick.

B21tg—12 to 21 inches, variegated gray (10YR 5/1) and grayish-brown (2.5Y 5/2) silty clay with many, medium, prominent mottles of strong brown (7.5YR 5/8); moderate, medium, blocky structure; firm when moist, very sticky and plastic when wet; roots few to common; discontinuous coatings of grayish-brown (2.5Y 5/2) clay; extremely acid; gradual, wavy boundary. 8 to 10 inches thick.

B22tg—21 to 42 inches, gray (10YR 5/1) silty clay with many, coarse, distinct mottles of brown or dark brown (10YR 4/3); weak, coarse, blocky structure; very firm when moist, very sticky and plastic when wet; very few roots; some coats and flows of dark-gray (5Y 4/1) clay; very strongly or extremely acid; clear, smooth boundary. 20 to 24 inches thick.

Cg—42 to 60 inches +, gray or light-gray (N 6/0), dense silty clay with a few, fine, prominent mottles of strong brown (7.5YR 5/6); massive (structureless); extremely firm when moist, sticky and plastic when wet; no roots; very strongly or extremely acid.

In Queen Annes County the texture of the A horizon is loam or silt loam. The Bt horizons are typically clay or silty clay and have a clay content that averages a little more than 40 percent. The solum typically ranges from 35 to 45 inches in thickness. In some places the Cg horizon is missing, and in places it is underlain, within 60 inches of the surface, by an unconformable IIC horizon that is definitely sandy.

The hue of all horizons is mainly about 2.5Y but ranges from 10YR to neutral. The A1 horizon has a value of 2, 3, or 4, and the Ap horizon has a value of 4 or 5. Below the A1 or the Ap horizon, the value of the matrix is most commonly 5 but ranges as high as 7, and the chroma of the matrix is generally 1 but may be 0 to 2. Most mottling has a hue of 10YR or 7.5YR, a value of 4 or 5, and a chroma of 3 to 8, but most commonly the chroma of mottles is no higher than 6. For a dry soil, the value of all horizons generally is one unit higher than that given, which is for a moist soil.

Structure ranges from weak to moderate and everywhere is distinct in genetic horizons. The finest textured horizons are very sticky when wet, but none is highly plastic. The Elkton soils generally are very strongly or extremely acid unless they have been limed. However, the unconformable IIC horizon, where present, may be less strongly acid than the solum.

The Elkton soils occur on upland flats and in gently sloping areas, where they formed in silty clays underlain by various kinds of older sediments. In the same kind of material were formed the Keyport soils, which are only slightly wet, and the Bayboro soils, which are even more wet than the Elkton soils.

The Elkton soils are similar to the Bladen soils in some respects, but they formed in less clayey sediments, are not so fine textured throughout, and have mottles that tend to be lower in chroma. The Elkton soils are similar to the Fallsington and Othello soils in general morphology, but they are less sandy and siliceous throughout than the Fallsington soils, and their Bt horizons are lower in silt content and higher in clay content than those of the Othello soils.

In Queen Annes County the Elkton soils are extensive and are important to agriculture. Where drainage is improved, they are used for corn, soybeans, and pasture. The native vegetation consists mostly of wetland hardwoods in mixed stands, and there are many white oaks, but loblolly pine is common in cutover or previously cleared areas.

Fallsington series

The Fallsington series consists of poorly drained soils that are moderately sandy and dominantly gray throughout. In these soils the B21tg and B22tg horizons always contain more clay than the A horizon, but they are moderately permeable.

Following is a profile of Fallsington sandy loam in a nearly level wooded area, about 4 miles northeast of Church Hill:

O1—2 inches to ½ inch, litter of leaves and twigs.

O2—½ inch to 0, mat of decomposed organic material.

A1—0 to 5 inches, very dark grayish-brown (10YR 3/2) sandy loam; moderate, medium, granular structure; friable when moist, slightly sticky and nonplastic when wet; roots plentiful; very strongly acid; gradual, wavy boundary. 3 to 5 inches thick.

A2g—5 to 10 inches, gray (10YR 5/1) sandy loam; moderate, medium, granular structure; very friable when moist, slightly sticky and nonplastic when wet; roots common; extremely acid; gradual, smooth boundary. 4 to 6 inches thick.

B1g—10 to 16 inches, gray (10YR 5/1) heavy sandy loam with common, medium, faint mottles of pale brown (10YR 6/3); weak, medium, blocky structure; friable when moist, sticky and slightly plastic when wet; few roots; very strongly or extremely acid; gradual, smooth boundary. 4 to 6 inches thick.

B21tg—16 to 24 inches, light-gray (5Y 7/1) sandy clay loam with common, coarse, prominent mottles of yellowish brown (10YR 5/8); moderate, medium, subangular blocky structure; friable to firm when moist, sticky and plastic when wet; very few roots; very strongly or extremely acid; gradual, wavy boundary. 6 to 10 inches thick.

B22tg—24 to 35 inches, light brownish-gray (10YR 6/2) sandy clay loam with common, medium, distinct mottles of brownish yellow (10YR 6/6); moderate to strong, fine, blocky and weak, coarse, platy structure; firm when moist, sticky and plastic when wet; no roots; some dark-gray (5Y 4/1) clay coatings; extremely acid; abrupt, smooth boundary. 8 to 12 inches thick.

IICg—35 to 50 inches +, light brownish-gray (10YR 6/2), stratified sand and some fine gravel with common, coarse, prominent mottles of yellowish brown (10YR 5/6); no roots; very strongly or extremely acid.

In this county the texture of the A horizon is loam or sandy loam. The Bt horizons are chiefly sandy clay loam but range from heavy sandy loam to heavy sandy clay loam. These horizons typically have a clay content of more than 18 percent, and they generally are 50 to 70 percent sand and fine sand. In places there are B1 and B3 horizons, which are transitional in texture and in most other characteristics.

The solum ranges from 20 to 40 inches in thickness but most commonly is somewhat less than 30 inches thick. In some places there is a thin Cg horizon just below the solum. This horizon is typically nongravelly, and it contains some silt and clay but significantly less than the Bt horizons of the solum.

In cultivated areas the plow layer is generally 10 to 12 inches thick and has had part or all of the A2 horizon mixed into it. Except in mottles, the hue in all horizons is mainly 2.5Y but generally ranges from 10YR to 5Y, though in places it is neutral in the finest textured horizons. The A1 horizon has a value of 3 or 4 and a chroma of 1 or 2, and the Ap horizon has a value of 4 or 5 and a chroma of 1 or 2. In the A2 horizon the value is 5 or, in some places, 6 and the chroma is 1 or 2. In the B horizon the value of the matrix is generally 5 or 6 and the chroma is generally 1 but ranges from 0 to 2. Mottles in the B horizon are normally 10YR in hue, 5 or 6 in value, and 3 to 8 in chroma. The higher chroma generally is in the finer textured horizons. In some places where the matrix chroma is 2, there are mottles with a chroma of 0 or 1. In the C horizon, the value is 6 or 7 and the chroma is 0, 1, or 2. Mottles may occur in the C horizon and, if present, are similar to those in the lower part of the solum. When dry, all horizons commonly have values one unit higher than those given, which are for a moist soil.

The A horizon generally has weak to moderate, granular structure, but the A2 horizon has weak, subangular blocky structure in some places. Structure in the B horizon is mostly subangular blocky but is angular blocky in some places, and it is weak or moderate or, in places, strong. The Bt horizons may have weak platy structure. Stickiness and plasticity are greatest in the Bt horizons, where the content of clay is highest. The Fallsington soils are very strongly or extremely acid unless they have been limed.

The Fallsington soils occur on level or gently sloping interfluvial uplands. They formed in moderately clayey and silty sands over coarser sediments. These soils are similar to the Elkton and Othello soils in general morphology and in degree of wetness, but they contain more sand and less silt throughout the solum than the Othello soils, and they contain more sand and less silt and clay than the Elkton soils.

The Fallsington soils occur closely with the Sassafras, Woodstown, and Pocomoke soils, all of which developed in the same kind of material. They are not so well drained as the well drained Sassafras soils or the moderately well drained Woodstown soils, but they are less poorly drained than the very poorly drained Pocomoke soils, which show evidence of extreme wetness.

The Fallsington soils are among the more extensive in Queen Annes County. They are important to farming and as woodland, and a considerable acreage is cultivated. Artificial drainage is needed for corn, soybeans, and most other crops. Improved pasture is grown in some areas. The principal native trees are red maple, sweetgum, holly, water-tolerant oaks, and pond pine. Some second-growth and cutover areas are covered by mixed to almost pure stands of loblolly pine.

Galestown series

The soils of the Galestown series are very deep, very sandy, and somewhat excessively or excessively drained. These soils are coarse textured throughout and are characterized by a strong-brown B horizon.

Following is a profile of Galestown loamy sand on a slope of about 2 percent, in a forest of Virginia pine about 1 mile southwest of Crumpton:

O1—1 to ¼ inch, litter of needles of Virginia pine.

O2—¼ inch to 0, mat of decomposed organic material.

A11—0 to 3 inches, dark-gray (10YR 4/1) loamy sand; very weak, medium, granular structure; loose or very friable; roots plentiful; very strongly acid; clear, wavy boundary. 2 to 4 inches thick.

A12—3 to 8 inches, grayish-brown (10YR 5/2) loamy sand; very weak, fine, granular structure; loose; roots fairly plentiful; very strongly acid; abrupt, wavy boundary. 3 to 6 inches thick.

B2t—8 to 39 inches, strong-brown (7.5YR 5/6) loamy sand; very weak, coarse, blocky structure and medium, granular structure; very friable when moist, very slightly sticky and nonplastic when wet; roots common in upper part; sand grains distinctly coated and bridged; very strongly acid; clear, wavy boundary. 24 to 35 inches thick.

C1—39 to 55 inches, light yellowish-brown (10YR 6/4) sand; single grain (structureless); loose; a very few roots in upper part; sand grains are uncoated; very strongly or extremely acid; abrupt, wavy boundary. 12 to 20 inches thick.

IIC2—55 to 60 inches +, pale-brown (10YR 6/3) sandy loam with many horizontal streaks of light gray (10YR 7/1); massive (structureless); friable when moist, sticky and slightly plastic when wet; no roots; very strongly or extremely acid.

The Galestown soils are coarse textured throughout the A and B horizons. In some places they are loamy sand that grades to sand with depth, and in others they are sand in all horizons. However, the IIC horizon, which typically occurs within a depth of 6 feet in areas of gentle relief, is everywhere finer in texture than the overlying horizons and generally is sandy loam or sandy clay loam. The solum ranges from about 30 to nearly 50 inches in thickness.

In cultivated areas the Ap horizon is about 10 inches thick. The A1 horizon is 10YR or 2.5Y in hue, but the Ap horizon ranges from 10YR to 7.5YR because the upper part of the B2t horizon has been mixed into it. The value in the Ap and the A1 horizons ranges from 4 to 6, and the chroma ranges from 1 to 4. The B2 horizon is as red as 7.5YR in hue and, in some places, is 5YR. In the B2t horizon the value generally is 5 and the chroma is 6 to 8. The C horizon ranges from 10YR to 5Y in hue, from 5 to 7 in value, and from 2 to 6 in chroma. Both value and chroma normally decrease with depth. Generally, there is no evidence of wetness above the IIC horizon, which may be almost any color.

Typically, the Galestown soils have very weak structure. They are nonsticky or only slightly sticky and nonplastic above the IIC horizon. Unless the soils have been limed, they are strongly to extremely acid.

The Galestown soils grade into the Lakeland soils in such a way that, in some places, soils of the two series cannot be accurately separated on a map. The Galestown soils and the Lakeland soils are much the same except that the Lakeland soils do not have a B horizon. The Galestown soils also grade into the Downer soils, but Galestown soils do not have as strongly expressed Bt horizons as the Downer soils.

The Galestown soils are mostly cultivated, except in some steep and dunelike areas that are covered mainly by trees. The principal crops are corn, soybeans, and various truck crops, especially sweetpotatoes. The native vegetation consists of scrub hardwoods, mostly oaks, and Virginia pine. Some reforested areas are in stands of loblolly pine, but there is little or no undergrowth. These soils have a fairly limited acreage and occur chiefly in areas bordering the Chester River, but they are locally important for farming.

Johnston series

In the Johnston series are very poorly drained soils that occur on the flood plains of streams. These soils have a thick, black A horizon that is directly underlain by an unconforming sandy C horizon. The B horizon is lacking.

Following is a profile of Johnston loam in a level cultivated area on the flood plain of Long Marsh Ditch, about one-fourth mile north of its intersection with Edenburg Ditch:

A1p—0 to 9 inches, black (5YR 2/1) loam that is high in organic-matter content; moderate, medium, granular structure; friable when moist, sticky and slightly plastic when wet; roots abundant; strongly acid; clear, smooth boundary. 9 to 10 inches thick.

A12—9 to 23 inches, black (10YR 2/1) loam; weak, medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots plentiful in upper part, fewer below; many wormholes and old root channels filled with material that apparently is identical with the A1p horizon; very strongly acid; clear, smooth boundary. 12 to 15 inches thick.

A13—23 to 30 inches, black (5Y 2/1) loam to fine sandy loam; massive (structureless) to very weak, granular structure; compact, firm, and slightly brittle when moist, slightly sticky and slightly plastic when wet; few roots; dark-gray to black organic silt in old wormholes and root channels; extremely acid; abrupt, smooth boundary. 12 to 18 inches thick.

IIC1g—30 to 41 inches, light-gray (5Y 7/2) loamy fine sand with irregular streaks and blotches of brown (10YR 5/3) and very dark gray (5Y 3/1); single grain (structureless); loose; tends to flow when saturated; no roots; extremely acid; abrupt, smooth boundary. 4 to 6 inches thick.

IIIC2g—41 to 50 inches +, white (5Y 8/2) fine sandy clay with common, very coarse, prominent blotches of light olive brown (2.5Y 5/6); massive (structureless); very firm when moist, very sticky and very plastic when wet; no roots; extremely acid.

The Johnston soils in Queen Annes County have only a loam A horizon. Except for some differential effects of worm activity in the A horizon, there is little variation in texture or other characteristics above the IIC1g horizon. Some areas have a thin C horizon between the A13 and the IIC1g horizons. The IIC1g horizon is sand or loamy sand. In some places the finer textured IIIC2g horizon occurs at a depth of more than 5 feet. The solum consists entirely of the A horizon and ranges from 20 to 30 inches in thickness.

In wooded or other undisturbed areas, the A horizon is black and may have a mucky surface. In some areas that have been cultivated for a long time, the plow layer is very dark gray and has a value of 3 and a chroma of 0 or 1. Hue ranges from neutral or 5Y to 5YR. The C horizon is almost any color but everywhere is gleyed.

Structure in the A horizon is granular and decreases in grade with depth. Stickiness and plasticity range from slight to medium in the solum. These soils are very strongly or extremely acid unless they have been limed.

The Johnston soils occur only on flood plains, where they formed in fairly recent alluvium and a large amount of organic matter. The only other named soils on flood plains in the county are the Bibb soils, which do not have a black A horizon and are not so wet as the Johnston soils. The Johnston soils superficially resemble the Pocomoke and the Portsmouth soils, but they lack the Bt horizons that are present in those soils. In the Pocomoke soils the Bt horizons are sandy clay loam, and in the Portsmouth soils these horizons are silty clay loam.

Most areas of Johnston soils are still in woodland that consists of red maple, gum, holly, pond pine, and some water-tolerant oaks. Cleared areas are used chiefly for corn, but there are some improved pastures in the county. Although these soils are fairly extensive, they are important to farming only along some of the major streams.

Keyport series

The soils of the Keyport series are moderately well drained. They have slowly permeable B21t, B22t, and B23tg horizons that are high in content of clay and are mottled with gray colors in the lower part.

Following is a profile of Keyport silt loam in a level wooded area on Kent Island, about 1½ miles southwest of Romancoke:

O1—1 to ¼ inch, litter of hardwood leaves and twigs.

O2—¼ inch to 0, mat of decomposed organic material.

A1—0 to 3 inches, dark-gray (10YR 4/1) light silt loam; moderate, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots abundant; strongly acid; clear, smooth boundary. 3 to 4 inches thick.

A2—3 to 9 inches, light yellowish-brown (2.5Y 6/4) silt loam; weak, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots plentiful; very strongly acid; clear, smooth boundary. 6 to 8 inches thick.

B21t—9 to 20 inches, brownish-yellow (10YR 6/6) light silty clay; moderate, fine and medium, blocky structure; firm when moist, sticky and plastic when wet; roots fairly plentiful; discontinuous coatings of light yellowish brown (10YR 6/4); very strongly acid; clear, wavy boundary. 10 to 15 inches thick.

B22t—20 to 35 inches, light olive-brown (2.5Y 5/6) clay or fine silty clay with common, medium, distinct mottles of light gray (5Y 7/1) and common, medium, prominent mottles of strong brown (7.5YR 5/6); strong, medium, blocky structure; very firm when moist, very sticky and plastic when wet; a very few roots in upper part; distinct coatings and flows of dark yellowish-brown (10YR 4/4) clay; very strongly or extremely acid; gradual, wavy boundary. 12 to 20 inches thick.

B23tg—35 to 44 inches, dark-gray (5Y 4/1) clay with a few, fine, distinct mottles of light gray (5Y 7/1) and common, coarse, prominent mottles of strong brown (7.5YR 5/6); strong, coarse, blocky structure; very firm when moist, very sticky and very plastic when wet; no roots; thin patchy coats and a few distinct flows of dark yellowish-brown (10YR 4/4) clay, most prominent in upper part; very strongly or extremely acid; gradual, wavy boundary. 0 to 12 inches thick.

Cg—44 to 55 inches +, dark-gray (5Y 4/1) silty clay that is irregularly streaked with dark grayish brown (10YR 4/2); massive (structureless); extremely firm when moist, very sticky and very plastic when wet; no roots; extremely acid.

The A horizon of Keyport soils is loam or silt loam in normal profiles, but in severely eroded areas the plow layer is silty clay loam where part of the B horizon has been mixed into it. The Bt horizons are fine textured, at least in the major part, and have an average clay content of a little more than 40 percent. The C horizon is clay, silty clay, heavy silty clay loam, or heavy clay loam. In places there is an unconforming sandy IIC horizon within a 5-foot depth. This horizon lies beneath the Cg horizon or replaces it.

The A and Bt horizons generally are 10YR or 2.5Y in hue, but in some places the Bt horizons are 5Y in the lower part, or they may approach 7.5YR. Normally, the A1 or the Ap horizon has a value of 3 or 4 and a chroma of 1 or 2. The A2 horizon generally has a value of 4 to 6 and a chroma of 2 to 4. The Bt horizons have a value of 4, 5, or 6, and a chroma generally of 6 but ranging from 1 to 8. A chroma of less than 6 is confined mostly to the lower part of the Bt horizons, where they are transitional to the C horizon. Such a transitional B23tg horizon is lacking in many places. Mottling in the B22t horizon and below it may be highly divergent, but everywhere there are some mottles with a chroma of 2 or less. The C horizon is dominated by gray colors and may be strongly mottled. For all horizons, the values of a dry soil may be one or two units higher than those given, which are for a moist soil.

Structure is generally weak or moderate granular in the A horizon, but in some places the A2 horizon has thin, weak, platy structure. The Bt horizons have moderate to strong blocky structure. They are sticky and commonly are more plastic than the B horizons of other soils on uplands in the county. The Keyport soils are strongly acid to extremely acid unless they have been limed.

In this county the Keyport soils are similar to the Mattapex and the Woodstown soils in color and degree of wetness, but they have finer textured Bt horizons. The Bt horizons in the Mattapex soils are light silty clay loam, and those in the Woodstown soils are sandy clay loam or heavy sandy loam.

The Keyport soils occur on level to moderately sloping uplands and formed in highly clayey sediments. Formed in the same general kind of material were the wet Bladen and Elkton soils, which have a light-colored surface layer, and the very wet Bayboro soils, which have a thick very dark surface layer.

The Keyport soils are fairly extensive in Queen Annes County and occupy a total of nearly 10,000 acres. Some areas of these soils are used for corn, soybeans, hay, and pasture, but many areas are still wooded. The principal native trees are mixed oaks, and there is some sweetgum and red maple. Loblolly pine or Virginia pine occurs locally, and some cutover and second-growth areas have fairly pure stands.

Klej series

The soils of the Klej series are very deep and very sandy. Because these soils have a fluctuating water table, however, they have mottled colors below a depth of about 20 inches. They are only moderately well drained, but water readily moves through them.

Following is a profile of Klej loamy sand in a level wooded area about one-fourth mile north of Unicorn, not far from the Chester River:

O1—2 inches to ½ inch, litter of pine and hardwood leaves and twigs.

O2—½ inch to 0, mat of decomposed organic material.

A11—0 to 2 inches, grayish-brown (2.5Y 5/2) loamy sand; very weak, medium, granular structure; very friable when moist, very slightly sticky and nonplastic when wet; roots plentiful; very strongly acid; clear, wavy boundary. 2 to 3 inches thick.

A12—2 to 9 inches, light brownish-gray (2.5Y 6/2) loamy sand; very weak, medium, granular structure; very friable; roots fairly plentiful; very strongly acid; clear, wavy boundary. 5 to 8 inches thick.

C1—9 to 19 inches, olive-yellow (2.5Y 6/6) loamy sand; single grain (structureless); loose; roots fairly common; extremely acid; gradual, irregular boundary. 8 to 15 inches thick.

C2—19 to 39 inches, olive-yellow (2.5Y 6/6) very light loamy sand with common, medium, faint mottles of light brownish gray (2.5Y 6/2); single grain (structureless); loose; a few fine roots; extremely acid; gradual, irregular boundary. 12 to 20 inches thick.

C3g—39 to 47 inches, light brownish-gray (2.5Y 6/2) sand with common, medium, prominent mottles of brownish yellow (10YR 6/6) and common, coarse, distinct mottles of gray or light gray (5Y 6/1); single grain (structureless), loose; a very few roots; extremely acid; abrupt, smooth boundary. 8 to 15 inches thick.

IIC4g—47 to 55 inches +, light-gray (2.5Y 7/2) heavy sandy loam with common, coarse, prominent mottles of light yellowish brown (10YR 6/4); massive (structureless); friable when moist, sticky and slightly plastic when wet; no roots; extremely acid.

The Klej soils are coarse textured throughout the A and C horizons, but they commonly have a nonconformable IIC horizon of moderately coarse to medium texture within a depth of 6 feet. In Queen Annes County the A horizon and the upper part of the C horizon are loamy sand, the lower part of the C horizon is sand, and the IIC horizon is sandy loam.

Cultivated areas have an Ap horizon that replaces the A1 horizon and is as much as 12 inches thick. Hue throughout the profile is mainly 2.5Y but ranges from 10YR to 5Y. The Ap or the A11 horizon has a value of 4 or 5 or rarely 6 and a chroma of 1 or 2. The A12 horizon has a value of 4 to 6 and a chroma of 2 to 4.

The upper part of the C horizon (C1 and C2) has a value of 5 or 6 and a chroma of 4 or 6 or rarely as low as 2. Generally, the C3g and IIC4g horizons have a value of 6 or 7 and a chroma of 1 to 3. The depth to mottling ranges from 15 to 24 inches. The contrast of the mottles to the matrix is lower in the upper part of the profile than it is in the deeper horizons.

Typically, the Klej soils are structureless except for weak, granular structure in the A horizon, and locally there is very weak, irregular blocky structure in the upper

C horizon. These soils are not sticky or plastic in the C horizon. Unless they have been limed, they normally are very strongly or extremely acid.

The moderately well drained Klej soils somewhat resemble the Woodstown soils in color and in degree of wetness, but they lack the Bt horizons of the Woodstown soils. The Klej soils formed on uplands in very sandy material. Also formed in sandy material were the somewhat excessively or excessively drained Galestown and Lakeland soils and the poorly drained Plummer soils, which are grayer than the Klej soils.

The Klej soils are inextensive and of little importance in Queen Annes County. Farmed areas are used principally for corn and soybeans. Most areas are still in stands of mixed oaks, sweetgum, red maple, and a few loblolly pines.

Lakeland series

The soils of the Lakeland series are very deep, very sandy, and somewhat excessively or excessively drained. These soils are coarse textured throughout. They have no B horizon but have yellow to yellowish-brown colors in parts of their C horizon. Water moves very rapidly through these soils.

Following is a profile of Lakeland loamy sand, clayey substratum, in a gently sloping wooded area, about one-half mile north of Unicorn, near the Chester River:

O1—2 inches to ½ inch, ground litter, mostly needles of Virginia pine.

O2—½ inch to 0, mat of decomposed organic material.

A11—0 to 4 inches, grayish-brown (10R 5/2) loamy sand; very weak, medium, granular structure; loose; roots plentiful; very strongly acid; clear, irregular boundary. 2 to 5 inches thick.

A12—4 to 14 inches, pale-yellow (2.5Y 7/4) loamy sand; single grain (structureless); loose; roots fairly plentiful; very strongly acid; gradual, irregular boundary. 6 to 12 inches thick.

C1—14 to 33 inches, light yellowish-brown (10YR 6/4) loamy sand; single grain (structureless); loose; roots common in upper part, very few below; very strongly acid; gradual, irregular boundary. 16 to 24 inches thick.

C2—33 to 58 inches, very pale brown (10YR 7/3) sand; single grain (structureless); loose; very few roots; slightly streaked with light gray in lower part; very strongly acid; abrupt, smooth boundary. 16 to 24 inches thick.

IIC3g—58 to 66 inches +, light-gray (10YR 7/1) sandy loam with irregular streaks and blotches of grayish brown (2.5Y 5/2); massive (structureless); friable to firm when moist, sticky and slightly plastic when wet; a few roots on upper surface; very strongly acid.

The Lakeland soils are coarse textured throughout the A and C horizons, but they have a finer textured IIC horizon that commonly occurs within a depth of 6 feet. The A horizon and the upper part of the C horizon are sand or loamy sand, but the C2 horizon is almost invariably sand. The IIC horizon may be almost any texture finer than the A horizon and generally is within a 6-foot depth only on gentle slopes.

In cultivated areas the Ap horizon is about 10 inches thick. Hue above the IIC horizon is 2.5Y or 10YR but nowhere is redder than 10YR. The A horizon has a value of 5 to 7. Chroma in the A11 or the Ap horizon generally is 2 and in the A12 horizon is 3 or 4. The C horizon has a value of 6 or 7 and a chroma generally of 4 but ranging from 3 to 6 in the various subhorizons. The IIC horizon may be almost any color. Except in the IIC horizon or, in places, immediately above it, there is no grayness, mottling, or other evidence of wetness.

The Lakeland soils typically are structureless, though in some places they have very weak, granular structure in the A horizon. There is no stickiness or plasticity above the IIC horizon. Unless they have been limed, these soils are strongly acid to extremely acid.

The Lakeland soils grade into the Galestown soils and are much the same as them, but the Lakeland soils lack the B horizon of the Galestown soils. Formed in the same kind of very sandy material as the Lakeland soils are also the Klej and the Plummer soils. The Klej soils are slightly wet and have mottling in the lower part of the C horizon, and the Plummer soils are even wetter than the Klej soils, as shown by gray and gleyed colors.

The Lakeland soils occupy a rather small acreage in Queen Annes County. They occur on broad flats and in dunelike areas of uplands that are level to rather strongly sloping. The more gentle slopes are commonly used for truck crops, including sweetpotatoes, and for corn and soybeans. Most of the stronger slopes are still in trees, chiefly scrub hardwoods. Virginia pine and some loblolly pine grow in cutover and second-growth areas.

Matapeake series

The soils of the Matapeake series are deep and well drained. They have a grayish-brown A horizon and somewhat finer textured B21t and B22t horizons that are dominantly brown in color. The soils are generally highly silty and are moderately permeable.

Following is a profile of Matapeake silt loam in a nearly level cultivated area on Wilmer Neck Road, near Pocometh:

Ap—0 to 11 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots plentiful; slightly acid (limed); abrupt, smooth boundary. 9 to 11 inches thick.

B21t—11 to 21 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; moderate, fine, blocky and subangular blocky structure; friable to firm when moist, sticky and slightly plastic when wet; roots common; irregular coatings of dark grayish-brown (10YR 4/2) clay or silt; medium acid; gradual, wavy boundary. 9 to 12 inches thick.

B22t—21 to 32 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, medium, blocky structure; firm when moist, sticky and plastic when wet; few roots; almost continuous coatings of dark yellowish-brown (10YR 4/4) clay; strongly acid; gradual, wavy boundary. 10 to 30 inches thick.

IIB23t—32 to 37 inches, strong-brown (7.5YR 5/6) fine sandy clay loam; weak, medium, blocky structure; firm when moist, sticky and slightly plastic when wet; very few roots; distinct but discontinuous coatings of dark yellowish-brown (10YR 4/4) clay, and a few prominent flows; strongly acid; clear to abrupt, wavy boundary. 0 to 6 inches thick.

IIC—37 to 50 inches +, grayish-brown (10YR 5/2) fine sandy loam; massive (structureless); very friable when moist, slightly sticky and nonplastic when wet; a very few roots; strongly or very strongly acid.

In this county the A horizon is fine sandy loam, loam, or silt loam. The Bt horizons are silty clay loam or heavy silt loam and have a clay content of more than 18 percent. In some places the IIB23t horizon is lack-

ing, and the B22t horizon is directly underlain by the sandy IIC horizon. In other places both the IIB23t and the IIC horizons are lacking. In these places the B22t horizon occurs directly on a C horizon of highly silty material, and the solum generally is much thicker than the one described. The solum ranges from about 28 to more than 55 inches in thickness.

Undistrubed areas have a thin A1 horizon and a somewhat thicker A2 horizon. These horizons are 10YR or 2.5Y in hue. The A1 horizon normally has a value of 3 or 4 and a chroma of 2; the Ap horizon has a value of 4 or 5 and a chroma of 2 to 4; and the A2 horizon has a value of 5 or 6 and a chroma generally of 4. Part or all of the Bt horizons is 7.5YR in hue, but in some profiles a part of the Bt horizons is 10YR in hue. Value is 4 or 5, and chroma ranges from 4 to 6 but everywhere is 4 in at least some part. The C and IIC horizons generally have a hue of 10YR or 2.5Y and a value and a chroma of 2 to 6. For a dry soil, the values of all horizons may be one unit higher than those given, which are for a moist soil.

Structure is normally moderate but is weak in parts of some horizons. The A horizon has granular structure or, in some places, weak, subangular blocky structure. In the Bt horizons, structure commonly is blocky and subangular blocky. The Bt horizons are sticky and vary in plasticity from slight to moderate. Unless they have been limed, the Matapeake soils generally are strongly or very strongly acid, but the C horizons are extremely acid in some places.

The Matapeake soils occur on nearly level to strongly uplands, where they formed in very silty material, possibly eolian, over older sandy sediments at shallow to moderate depths. Also formed in the same silty materials were the slightly wet Mattapex soils, the moderately wet Bertie soils, the gray, wet Othello soils, and the very wet Portsmouth soils. The Matapeake soils are similar to the Sassafras soils in color and in other characteristics but are more silty throughout the solum. In the Matapeake soils, the silty clay loam or heavy silt loam B21t and B22t horizons are characteristic, whereas the Sassafras soils have Bt horizons of heavy loam, heavy sandy loam, or sandy clay loam.

The Matapeake soils are extensive in Queen Annes County and are important to farming and other uses. The principal crops are corn, soybeans, hay, and some truck crops. Wooded areas are in stands of mixed hardwoods, dominantly oaks, and there is some loblolly pine in cutover and second-growth areas.

Mattapex series

In the Mattapex series are soils on uplands that are dominantly silty and moderately well drained. These soils have B21t and B22t horizons that are mottled with grayish colors in the lower part and are moderately slow in permeability.

Following is a profile of Mattapex loam in a gently sloping cultivated area on Mattapex plantation on Kent Island, about one-fourth mile west of State Route 33:

Ap—0 to 11 inches, dark grayish-brown (10YR 4/2) loam; weak, medium, granular structure; friable when moist, slightly sticky and nonplastic when wet; abundant roots and old root channels; medium acid (limed); abrupt, smooth boundary. 10 to 12 inches thick.

B1—11 to 15 inches, brown (10YR 5/3) heavy loam; weak to moderate, medium, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; root channels plentiful; strongly acid; gradual, smooth boundary. 0 to 6 inches thick.

B21t—15 to 26 inches, yellowish-brown (10YR 5/6) light silty clay loam; moderate, medium, subangular blocky structure; rather firm when moist, sticky and plastic when wet; few root channels; distinct but not prominent clay coats on some aggregates; strongly acid; gradual, smooth boundary. 10 to 15 inches thick.

B22t—26 to 36 inches, light olive-brown (2.5Y 5/4) light silty clay loam with common, medium, distinct mottles of light brownish gray (2.5Y 6/2) and strong brown (7.5YR 5/6); very weak, medium, platy structure and weak, fine to medium, subangular blocky structure; firm and somewhat brittle when moist, sticky and plastic when wet; no roots; yellowish-brown (10YR 5/6) clay coats on some aggregates; very strongly acid; clear, wavy boundary. 6 to 12 inches thick.

IIC—36 to 50 inches +, yellowish-brown (10YR 5/4) light fine sandy loam or heavy loamy fine sand with common, medium, distinct mottles of light gray (2.5Y 7/2) and strong brown (7.5YR 5/6); massive (structureless); very friable when moist, nonsticky and nonplastic when wet; no roots; very strongly or extremely acid.

In Queen Annes County the A horizon is fine sandy loam, loam, or silt loam. The B21t and B22t horizons are silt loam or silty clay loam and have a clay content of more than 18 percent. Generally, these horizons contain less fine sand in areas where the A horizon is loam or silt loam than where it is fine sandy loam. In places there is a very silty C horizon between the B22t and the IIC horizons. All horizons may have some fine or very fine sand that grades toward medium sand in the IIC horizon. The solum ranges from 28 to 42 inches in thickness.

Wooded or other undisturbed areas have an A1 horizon 1 to 3 inches thick and an A2 horizon that is somewhat thicker. The hue throughout the solum is 2.5Y or 10YR, or both, in the same profile. The A1 or the Ap horizon has a value of 3 or 4 and a chroma generally of 2 but ranging from 1 to 3; and the A2 horizon normally has a value of about 5 and a chroma of about 4. In the Bt horizons the value is 5 or 6, and the chroma is 4, 6, or rarely 8, but is 4 in some part. Depth to mottling ranges from 18 to 24 inches. Some mottles in the B22t horizon have a chroma of 2 or less. Except in the grayish colors, chroma of the mottles is commonly higher with depth and thus, in many places, provides greater contrast. The C horizon generally differs little from the lower part of the Bt horizon in color. However, the IIC horizon may be almost any color and commonly is dominated by gray.

Structure is normally moderate in the Bt horizons and weak in the other parts of the solum, though in some places the B22t horizon has weak, platy structure. In the A horizon, structure is granular to weak, subangular blocky. The Bt horizons generally are blocky or subangular blocky in structure. Generally, they are sticky and plastic but not highly so, and they tend to be firm, particularly the B22t part. The Mattapex soils are strongly or very strongly acid unless they have been limed.

These soils are similar to the Keyport and the Woodstown soils in color, degree of wetness, and other characteristics. In the Keyport soils, however, at least some

part of the Bt horizons is clay or silty clay, and in the Woodstown soils the Bt horizons are much more sandy than the ones in the Mattapex soils.

The Mattapex soils occur on nearly level to moderately sloping uplands, where they formed in silty material, possibly eolian, over older sandy sediments. Formed in the same kind of material were the well-drained Matapeake soils; the somewhat poorly drained Bertie soils, which are wetter than the Mattapex soils; the gray, poorly drained Othello soils; and the very poorly drained Portsmouth soils.

The Mattapex soils occupy nearly 14,000 acres in this county and are agriculturally important. Most areas are used for crops or pasture, and many of them have been in these uses for more than three centuries. The principal crops are corn, soybean, and hay. In wooded areas the vegetation consists of hardwoods that tolerate some wetness and include sweetgum, many kinds of oaks, and some red maple. Sparse to good stands of loblolly pine occur in cutover and second-growth areas.

Othello series

The Othello series consists of very silty, poorly drained soils on uplands. These soils have gray, mottled B21tg and B22tg horizons that are rather slowly permeable.

Following is a profile of Othello silt loam in a level cultivated area, about 1 mile north of Bryantown and about one-half mile east of Robinson Church:

Ap—0 to 9 inches, dark grayish-brown (2.5Y 4/2) silt loam; very weak, fine and medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots abundant; medium acid (limed); abrupt, smooth boundary. 8 to 10 inches thick.

B21tg—9 to 18 inches, light olive-gray (5Y 6/2) light silty clay loam with a few, medium, faint mottles of light gray (5Y 7/1) and common, medium, prominent mottles of yellowish brown (10YR 5/6); weak, fine and medium, blocky and subangular blocky structure; friable to firm when moist, sticky and slightly plastic when wet; roots plentiful in upper part, fewer below; some coatings of dark grayish brown (2.5Y 4/2); strongly acid; gradual, smooth boundary. 8 to 12 inches thick.

B22tg—18 to 29 inches, gray or light-gray (5Y 6/1) light silty clay loam with common, coarse, prominent mottles of yellowish brown (10YR 5/4) and a few, medium, prominent mottles of strong brown (7.5YR 5/6); very weak, medium, platy structure and somewhat flattened, moderate, medium, subangular blocky structure; firm when moist, sticky and plastic when wet; very few roots; some light olive-gray (5Y 6/2) clay flows between some aggregates, in pores, and in old root channels; very strongly acid; clear to abrupt, smooth boundary. 8 to 12 inches thick.

IIC1g—29 to 34 inches, gray (N 5/0) sandy loam with common, medium, prominent mottles of strong brown (7.5YR 5/6); massive (structureless); to very weak, very coarse, blocky structure; compact and firm when moist, slightly sticky and very slightly plastic when wet; no roots; extremely acid; clear, smooth boundary. 3 to 6 inches thick.

IIC2g—34 to 48 inches +, light-gray (N 7/0) loamy sand; single grain (structureless); loose to very friable; no roots; some very coarse blotches and streaks of yellowish brown (10YR 5/6); extremely acid.

In Queen Annes County the texture of the A horizon is only silt loam. The B21tg and B22tg horizons are heavy silt loam or silty clay loam and have a clay content of 18 to 35 percent. Locally, there is a thin C horizon of very silty material between the B22tg and the IIC horizons. The solum ranges from 24 to 36 inches in thickness.

In wooded areas these soils have a thin A1 horizon and a somewhat thicker A2g horizon. Hue in the profile ranges from 10YR to 5Y and to neutral. A hue of 10YR generally is confined to the upper part of the profile, and the hue becomes more nearly neutral with depth. Value in the A1 or the Ap horizon is normally 4 or 5, and chroma is 0, 1, or 2. The A2 horizon has a value one or two units higher than the A1 or Ap horizon. Value of the matrix in the B and the C horizons ranges from 5 to 7, and the chroma is 0, 1, or 2. The IIC horizon may be almost any color. Mottling generally begins at the top of the Bt horizon but, in some places, occurs in the A2 horizon. Mottling is mostly 10YR or 7.5YR in hue, is 5 to 6 in value, and ranges from 1 to 8 but most commonly is 6 in chroma. For a dry soil, the values for all horizons generally are one unit higher than those given, which are for a moist soil.

Structure ranges from very weak to moderate and is strongest in the Bt horizons. In those horizons the structure is most commonly blocky but tends to be platy or subangular blocky in some places. The Bt horizons generally are sticky and plastic but not highly so. Unless they have been limed, these soils are very strongly or extremely acid.

The Othello soils occur on level to gently sloping uplands, where they formed in very silty material, possibly eolian in part, over older sandy sediments. Also formed in the same kind of material are the well drained Matapeake soils, the moderately well drained Mattapex soils, the somewhat poorly drained Bertie soils, and the very poorly drained Portsmouth soils. The Othello soils are similar to the Fallsington and the Elkton soils in color, degree of wetness, and other characteristics. However, the Bt horizons in the Othello are dominantly silt, whereas those in the Fallsington soils are sandy clay loam or heavy sandy loam, and in the Elkton soils are silty clay or clay.

The Othello soils occupy nearly 10,000 acres in Queen Annes County. A considerable part of this acreage is used for crops, chiefly corn and soybeans. There is some hay and pasture, but large areas are covered by forest, much of which has been cut over. The principal trees are water-tolerant hardwoods, including red maple, sweetgum, and many kinds of oaks. Cutover and second-growth areas have some mixed to almost pure stands of loblolly pine.

Plummer series

Soils of the Plummer series are very deep, very sandy, and poorly drained. These soils are coarse textured throughout. Water moves rapidly through them, but they have a high water table for long periods each year.

Following is a profile of Plummer loamy sand in a level wooded area, about three-fourths mile southeast of Millington:

O1—2 inches to ½ inch, a litter of hardwood leaves and twigs.

O2—½ inch to 0, a mat of decomposed organic materials.

A11—0 to 4 inches, grayish-brown (2.5Y 5/2) loamy sand; single grain (structureless); loose; roots plentiful; very strongly acid; gradual, wavy boundary. 3 to 5 inches thick.

A12—4 to 10 inches, light brownish-gray (2.5Y 6/2) loamy sand; single grain (structureless); loose; roots fairly plentiful; very strongly acid; clear, irregular boundary. 4 to 8 inches thick.

C1—10 to 28 inches, light olive-gray (5Y 6/2) loamy sand with common, medium, distinct mottles of yellowish brown (10YR 5/4); single grain (structureless); loose; roots fairly common in upper part; extremely acid; gradual, irregular boundary. 10 to 20 inches thick.

C2g—28 to 46 inches, gray or light-gray (5Y 6/1) sand with common, coarse, prominent mottles of grayish brown (2.5Y 5/2); singlegrain (structureless); loose; no roots; extremely acid; abrupt, smooth boundary. 10 to 20 inches thick.

IIC3g—46 to 60 inches +, light-gray (5Y 7/1) sandy loam that is streaked with grayish brown (2.5Y 5/2), mostly horizontally; massive (structureless); friable when moist, sticky and slightly plastic when wet; no roots; extremely acid.

The Plummer soils are coarse textured in all horizons above the IIC3g horizon. The A horizon is only loamy sand in Queen Annes County, but the C horizon is loamy sand, sand, or fine sand. The uncomformable IIC horizon may be any abruptly different texture but nearly everywhere is finer textured than the horizon above it. Where present, the IIC horizon generally occurs within a 4- to 6-foot depth.

In cultivated areas the plow layer, when moist, is about the same color as the A11 horizon but, when dry, is light gray to almost white, particularly after long exposure to the weather. The hue of the entire profile is mainly 2.5Y but ranges from 10YR to 5Y and neutral. In most places the A horizon has a value of 4 to 6 and a chroma of 0, 1, or 2. Where the A11 horizon is thin, however, it may have a value of only 2 or 3. The value of the C horizon generally is 6 or 7 but ranges from 5 to 8, and the chroma is 0, 1, or 2. Mottling is not everywhere present in the C horizon. Where mottles occur, they are 5Y to 10YR in hue, 5 or 6 in value, and 2 to 8 in chroma. In many places the C horizon is uniformly gray, light gray, or white, and in other places it is variegated with these colors and may be streaked or stratified.

The Plummer soils are structureless, and they have no stickiness or plasticity in the C horizon. They are very strongly or extremely acid unless they have been limed.

These soils occur on level to depressional uplands and formed in sands containing very little silt or clay. Also formed in this kind of material are the Klej, Galestown, and Lakeland soils. The Plummer soils occur closely with and grade into the Klej soils, which are not so wet as the Plummer soils. The Klej soils have a higher chroma in the C horizon and no mottling above a depth of 15 to 24 inches. Plummer soils are not nearly so well drained as Galestown and Lakeland soils.

The Plummer soils are of minor extent and importance in Queen Annes County. Although they can be used for corn or soybeans, most of their acreage supports stands of red maple, sweetgum, and various water-tolerant hardwoods. Huckleberry forms the undergrowth in some places. In addition, there are some pond pines and a few loblolly pines.

Pocomoke series

Soils of the Pocomoke series are very poorly drained. They have a rather thick, black A horizon over a finer textured B2tg horizon that is dominantly gray, prominently mottled, and moderately permeable.

Following is a profile of Pocomoke sandy loam in a level wooded area, 0.6 mile west of Grange Hall Road and about 1 mile south of Starr:

O2—2 inches to 0, decomposed organic material and some moss.

A11—0 to 10 inches, black (10YR 2/1) sandy loam; moderate, coarse, granular structure; friable when moist, sticky and slightly plastic when wet; roots abundant; extremely acid; gradual, smooth boundary. 10 to 12 inches thick.

A12—10 to 14 inches, gray (5Y 5/1) sandy loam; moderate, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots plentiful; very strongly or extremely acid; clear, wavy boundary. 4 to 6 inches thick.

B1g—14 to 21 inches, olive-gray (5Y 5/2) heavy sandy loam with a few, coarse, prominent mottles of yellowish brown (10YR 5/6); weak, medium and coarse, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; a few roots; very strongly or extremely acid; clear, wavy boundary. 4 to 8 inches thick.

B2tg—21 to 26 inches, gray or light-gray (5Y 6/1) light sandy clay loam with abundant, coarse, faint mottles of gray (N 5/0) and common, medium, prominent mottles of yellowish brown (10YR 5/6); strong, fine, subangular blocky structure; firm when moist, sticky and plastic when wet; a few roots; olive-gray (5Y 5/2) coatings; very strongly or extremely acid; abrupt, wavy boundary. 4 to 12 inches thick.

IIC1g—26 to 38 inches, light brownish-gray (2.5Y 6/2) loamy sand; single grain (structureless); loose; a very few roots; very strongly or extremely acid; gradual, wavy boundary. 10 to 16 inches thick.

IIC2g—38 to 53 inches +, gray (N 5/0) loamy sand; single grain (structureless); loose; no roots; extremely acid.

In Queen Annes County the texture of the A horizon is loam or sandy loam. The B2tg horizon is heavy sandy loam or sandy clay loam and has a clay content typically of more than 18 percent. The IIC horizon is coarser in texture than any other part of the solum and, in places, contains fine gravel. The thickness of the solum ranges from 20 to 30 inches.

In undisturbed areas the surface of the A horizon may be somewhat mucky. The Ap horizon has a value of 3 and a chroma of 0 to 2. Normally, the A11 horizon is black, ranges in hue from 5YR to neutral, and has a value of 2 and a chroma of 0 to 1. The A12 horizon has a value one or two units higher than that in the A11 horizon.

Below the A horizon, the matrix has a hue of 10YR to neutral, a value that generally is 5 or 6 but ranges from 4 to 7, and a chroma that generally is 0 or 1 but is 2 in a few places. Mottling in the B horizon is normally of high contrast and generally has a value of 5 and a chroma of 6 to 8. In some places, however, there is mottling with grayish colors of low chroma, and some profiles are gray or variegated gray with very little or no mottling. The values given are for moist soil and generally are one unit lower than those of a dry soil.

Structure is mostly weak or moderate but may be strong in the Bt horizons. The A horizon has granular structure, and the B horizon is blocky, subangular blocky, or both. The finer textured horizons are slightly to moderately sticky and plastic. Unless these soils have been limed, they are very strongly or extremely acid, and they commonly have a pH of 4 or less.

The Pocomoke soils occur on level or nearly level uplands and formed in moderately clayey and silty sands over very sandy sediments. Also formed in this kind of

material are the well drained Sassafras soils, the moderately well drained Woodstown soils, and the poorly drained Fallsington soils. Fallsington soils are not so wet as Pocomoke soils.

The Pocomoke soils are similar in many respects to the Bayboro and the Portsmouth soils, which are members of the same great group and subgroup. However, the Pocomoke soils have a Bt horizon of heavy sandy loam or sandy clay loam that is moderately permeable, whereas the Portsmouth soils have a Bt horizon of silty clay loam that is more slowly permeable. In the Bayboro soils the B2tg horizon is highly clayey and very slowly permeable.

The Pocomoke soils occupy more than 6,500 acres in Queen Annes County. They are important to farming and for woodland products and wildlife habitat. Where the soils have been artificially drained, they are used for crops, especially corn and soybeans, and for pasture. Large areas, however, are still stands of red maple, gum, holly, various oaks, and other wetland hardwoods. Pond pines grow in some places, and second-growth and cutover areas have scattered trees to almost pure stands of loblolly pine.

Portsmouth series

The soils of the Portsmouth series are very poorly drained. They have a rather thick, black A horizon over sticky, silty B21tg and B22tg horizons that are dominantly gray, prominently mottled, and rather slowly permeable.

Following is a profile of Portsmouth silt loam, in a slightly depressional wooded area, about 25 yards west of State Route 405 and one-fourth mile south of Clark Corners:

O1—3 inches to 1 inch, litter of hardwood leaves.

O2—1 inch to 0, mucky mat of decomposed organic material.

A1—0 to 11 inches, black (10YR 2/1) silt loam that is very high in organic matter; weak, medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots abundant in top 3 inches, fewer below; very strongly acid; clear, smooth boundary. 10 to 12 inches thick.

B1g—11 to 16 inches, very dark gray (5Y 3/1) light silty clay loam with a few, medium, prominent mottles of brown or dark brown (7.5YR 4/4); weak, medium, subangular blocky structure; firm when moist, sticky and plastic when wet; roots fairly common; extremely acid; clear, smooth boundary. 4 to 6 inches thick.

B21tg—16 to 25 inches, dark olive-gray (5Y 3/2) silty clay loam with a few, medium, distinct mottles of light gray (5Y 7/2) and a few, fine, prominent mottles of brown (7.5YR 5/4); weak, medium, blocky structure; firm when moist, sticky and plastic when wet; few roots; some faint coatings of very dark gray (5Y 3/1); extremely acid; gradual, smooth boundary. 8 to 12 inches thick.

B22tg—25 to 37 inches, light olive-gray (5Y 6/2) heavy silty clay loam with common, medium, faint mottles of white (5Y 8/2) and common, fine, prominent mottles of strong brown (7.5YR 5/6); weak, medium and coarse, blocky structure; firm when moist, sticky and plastic when wet; a very few roots in upper part only; prominent coats and flows of dark olive-gray (5Y 3/2) clay; extremely acid; abrupt, smooth boundary. 10 to 15 inches thick.

IICg—37 to 48 inches +, light-gray (5Y 7/1) loamy sand or very light sandy loam with some horizontal streaks of grayish brown (2.5Y 5/2); massive (structureless); very friable when moist, slightly sticky and nonplastic when wet; no roots; extremely acid.

In this county the texture of the A horizon is silt loam. The B21tg and B22tg horizons are everywhere silty clay loam in at least some part, and no part of those horizons is finer textured. In some places the lower part of the Bt horizons is sandy clay loam as it grades into the IICg horizon. The clay content of the Bt horizons is between 18 and 35 percent. The IIC horizon is coarser in texture than any part of the solum, which ranges from 24 to 40 inches in thickness. In some places there is fine gravel in the IICg horizon.

In undisturbed areas the A1 horizon is black, is typically at least 10 inches thick, and locally has a somewhat mucky surface. The Ap horizon is gray only in areas that have been cultivated for a considerable period. Generally, the A horizon is 10YR in hue. The A1 horizon has a value of 2 and a chroma of 1 or, in a few places, of 0 where the hue is neutral. The Ap horizon has a value of 2, 3, or rarely 4 and a chroma of 0, 1, or 2. Below the A horizon, the hue generally is 5Y but in places is 2.5Y or neutral. The matrix of the Bt horizons has a value of 3 to 6 and a chroma of no more than 2. The IICg horizon varies in color but everywhere is gleyed. In some places the profile is not mottled. Where mottles occur, they have a hue of 5Y to 7.5YR, a value of 4 to 7, and a chroma of 2 to 6. The values of a dry soil generally are one unit higher than those given, which are for a moist soil.

Structure ordinarily is weak but, in some places, is moderate in the Bt horizons. In structure the A horizon is granular, and the Bt horizons are mostly blocky but are partly subangular blocky in some places. The Bt horizons are sticky and plastic but generally not highly so. Unless they have been limed, the Portsmouth soils are very strongly or extremely acid and commonly have a pH as low as 4 or less in some horizons.

The Portsmouth soils occur on level or slightly depressional uplands and formed in silty material, possibly in part eolian, over older sandy sediments. Formed in the same kind of material are the well drained Matapeake soils, the moderately well drained Mattapex soils, the somewhat poorly drained Bertie soils, and the poorly drained Othello soils. The Othello soils have a gray surface layer instead of the black surface layer that characterizes the Portsmouth soils.

The Portsmouth soils are similar to the Pocomoke and Bayboro soils, but their Bt horizons differ in texture. In the Portsmouth soils, at least part of the Bt horizons is rather slowly permeable silty clay loam, but in the Pocomoke soils these horizons are moderately permeable sandy clay loam or heavy sandy loam, and in the Bayboro soils they are highly clayey and very slowly permeable.

Portsmouth soils are inextensive in Queen Annes County. Where artificially drained, they are used for some crops, chiefly corn and soybeans. In this county, however, most areas are covered by stands of red maple, gums, water-tolerant oaks, and other wetland hardwoods. The undergrowth consists of holly, briers, and huckleberry. In most places there are some pond pines, and cutover areas may have loblolly pine.

Sassafras series

The Sassafras series consists of deep, well-drained soils on uplands. These soils have a moderately coarse

textured A horizon over sandy clay loam or heavy sandy loam B21t and B22t horizons that are moderately permeable.

Following is a profile of Sassafras sandy loam in a gently sloping wooded area, just south of DeCoursey Road and about one-fourth mile southwest of its intersection with Wye Island Road:

O1—3 inches to 1 inch, litter of hardwood leaves and pine needles.

O2—1 inch to 0, mat of decomposed organic material.

A1—0 to 2 inches, dark grayish-brown (2.5Y 4/2) sandy loam; moderate, medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots abundant; strongly acid; abrupt, irregular boundary. ½ inch to 4 inches thick.

A2—2 to 14 inches, grayish-brown (2.5Y 5/2) sandy loam; moderate, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots plentiful; very strongly acid; clear, wavy boundary. 8 to 12 inches thick.

B1—14 to 20 inches, yellowish-brown (10YR 5/4) loam or light sandy clay loam; weak, medium, blocky structure; friable when moist, sticky and slightly plastic when wet; roots common; discontinuous coatings of dark yellowish-brown (10YR 4/4) clay; very strongly acid; gradual, wavy boundary. 4 to 8 inches thick.

B21t—20 to 31 inches, brown (7.5YR 5/4) sandy clay loam; moderate, medium and coarse, blocky and subangular blocky structure; firm when moist, sticky and plastic when wet; a very few roots; prominent, almost continuous, dark-brown and yellowish-red (7.5YR 4/4 and 5YR 5/6) clay coats and flows; very strongly acid; gradual, wavy boundary. 9 to 15 inches thick.

B22t—31 to 43 inches, strong-brown (7.5YR 5/6) heavy sandy clay loam; moderate to strong, medium, blocky and subangular blocky structure; firm when moist, sticky and plastic when wet; continuous, prominent, reddish-brown (5YR 4/4) clay coats; flows, and krotovinas; very strongly acid; clear, wavy boundary. 12 to 20 inches thick.

C—43 to 50 inches +, yellowish-brown (10YR 5/6) heavy loamy sand; single grain (structureless); very friable when moist, nonsticky and nonplastic when wet; no roots; extremely acid.

In Queen Annes County the texture of the A horizon is loam or sandy loam. The B21t and B22t horizons are heavy sandy loam, sandy clay loam, or in some places loam, and they have a clay content of 18 to 35 percent. In some places there are transitional B1 and B3 horizons. The C horizon is sandy loam or loamy sand. The solum ranges from 30 to nearly 50 inches in thickness and has a modal thickness of 36 to 40 inches.

The hue of the A horizon is 10YR or 2.5Y. The A1 horizon has a value of 3 or 4 and a chroma of 2; the Ap horizon generally has a value of 4 or 5 and a chroma of 2; and the A2 horizon generally has a value of 5 or 6 and a chroma of 2 to 4. In the Bt horizons, hue is 10YR or 7.5YR, value is 4 or 5, and chroma is either 4 or 6 but typically is 4 in at least some part. The C horizon generally is 10YR in hue, 5 or 6 in value, 3 to 6 in chroma.

Structure is mostly moderate in the Bt horizons and is weak to moderate in the A horizon. In structure the A horizon is granular, and the Bt horizons are blocky, subangular blocky, or both. The finest textured parts of the Bt horizons are sticky and plastic but not highly so. Unless they have been limed, the Sassafras soils normally are strongly or very strongly acid, but some horizons are extremely acid in some places.

The Sassafras soils occur on level to steep uplands and formed in moderately silty and clayey sands. Formed in the same kind of material are the slightly wet Woodstown soils, the wet Fallsington soils, which have a gray surface layer, and the very wet Pocomoke soils, which normally have a black surface layer.

The Sassafras soils are somewhat similar to the Matapeake and Downer soils in color and in drainage. The Downer soils have a coarser textured A horizon and thinner Bt horizons that typically are less than 18 percent clay. Throughout the solum the Matapeake soils are much more silty than the Sassafras soils.

In Queen Annes County the Sassafras soils occupy more than 70,000 acres and account for nearly 30 percent of the total land area. These soils are highly valued for most crops, and most of their acreage is cultivated. The principal crops are soybeans, corn, sweetpotatoes, miscellaneous truck crops, hay, and pasture. The native vegetation consists of upland hardwoods, dominantly oaks, but some cutover and second-growth areas are in mixed to almost pure stands of Virginia pine or loblolly pine.

Woodstown series

In the Woodstown series are deep, moderately well drained soils on uplands. These soils have a moderately coarse textured or medium-textured A horizon over sandy clay loam or heavy sandy loam B21t and B22t horizons that are moderately slowly permeable and are mottled in the lower part.

Following is a profile of Woodstown sandy loam in a nearly level wooded area, about 200 yards north of McGinnes Road and one-fourth mile west of McGinnes:

O1—3 inches to 1 inch, loose litter of leaves, mostly of hardwoods.

O2—1 inch to 0, mat of decomposed organic material.

A1—0 to 3 inches, dark grayish-brown (10YR 4/2) sandy loam; weak, medium, granular structure; friable when moist, nonsticky and nonplastic when wet; roots plentiful; strongly acid; clear, wavy boundary. 2 to 4 inches thick.

A2—3 to 13 inches, light yellowish-brown (2.5Y 6/4) sandy loam; weak, medium, granular structure; friable when moist, slightly sticky and nonplastic when wet; roots common; very strongly acid; clear, wavy boundary. 8 to 12 inches thick.

B21t—13 to 24 inches, yellowish-brown (10YR 5/6) light fine sandy clay loam; moderate, medium, blocky and subangular blocky structure; friable or somewhat firm when moist, sticky and slightly plastic when wet; roots fairly common; a few thin coatings of dark yellowish-brown (10YR 4/4) clay; very strongly acid; gradual, wavy boundary. 9 to 14 inches thick.

B22t—24 to 34 inches, light yellowish-brown (10YR 6/4) fine sandy clay loam with a few, medium, distinct mottles of grayish brown (2.5Y 5/2) and a few, fine, distinct mottles of strong brown (7.5YR 5/6); weak, coarse, blocky structure; friable or firm when moist, sticky and slightly plastic when wet; a very few, fine roots; prominent coatings and some flows of yellowish-brown (10YR 5/4) clay; abrupt, wavy boundary. 10 to 15 inches thick.

C—34 to 48 inches, variegated pale-brown (10YR 6/3), brownish-yellow (10YR 6/6), and strong-brown (7.5YR 5/6) light sandy loam with common, medium, distinct mottles of grayish brown (2.5Y 5/2); stratified, more or less by basic colors, in strata ½ inch to 3 inches thick; very friable when moist, slightly sticky and nonplastic when wet; no roots; extremely acid.

In Queen Annes County the texture of the A horizon is loam or sandy loam. The B21t and B22t horizons are heavy sandy loam or sandy clay loam and typically have a clay content of 18 to 35 percent. In places the

C horizon is replaced by a IIC horizon, and in other places it is underlain by a IIC horizon within a 5-foot depth. The IIC horizon is any unconformable texture but most commonly is coarser textured than the solum. The thickness of the solum ranges from 24 to 40 inches or more.

In cultivated areas all of the natural A2 horizon may be mixed into the Ap horizon, or plow layer. The solum has a hue of 2.5Y, 10YR, or both. The A1 horizon generally has a value of 3 or 4 and a chroma of 1 or 2. Normally, the Ap horizon is one or two units higher than the A1 horizon in value and is as much as 3 in chrome. The A2 horizon has a value of 5 or 6, and, in most places, a chroma of 4. In the B21t and B22t horizons the value is 5 or 6, and the chroma of the matrix is 4 or 6 but everywhere is 4 in at least some part. Mottling is of low to moderate contrast. In most places the depth to mottling is 18 to 26 inches, but there are no mottles with a chroma as low as 2 within the upper 10 inches of the Bt horizons. The C horizon is almost any color or mixture of color and, in many places, is gleyed. The values of a dry soil are one or two units higher than those given, which are for a moist soil.

Structure ordinarily is weak, but it is moderate in the Bt horizons in some places. Generally, some part of the Bt horizons is sticky or plastic, or both. Unless they have been limed, these soils are strongly acid to extremely acid.

The Woodstown soils occur on level to strongly sloping uplands, where they formed in moderately silty and clayey sands. Also formed in this kind of material are the well-drained Sassafras soils; the poorly drained Fallsington soils, which have a gray surface layer; and the very poorly drained Pocomoke soils, which normally have a black surface layer. The Woodstown soils are similar to the Keyport and the Mattapex soils in general characteristics. In the Woodstown soils, however, the Bt horizons are sandy loam to sandy clay loam, whereas in the Keyport soils they are clay or silty clay, at least in some part, and in the Mattapex soils they are silty clay loam.

The Woodstown soils occupy more than 23,000 acres in Queen Annes County and are important to farming and for woodland products. Fairly large areas are used for crops, principally corn and soybeans, but many areas remain wooded and are in stands of mixed hardwoods that are dominated by oaks but include red maple, holly, and other water-tolerant trees. Loblolly pine is fairly common, especially in cutover and second-growth areas.

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Glossary

Acidity, soil. (See Reaction, soil.)

Alluvium. Fine material, such as sand, silt, or clay, that has been deposited on land by streams.

Available moisture capacity. The difference between the amount of water in a soil at field capacity and the amount in the same soil at the permanent wilting point. Commonly expressed as inches of water per inch depth of soil.

Chroma. (See Color, Munsell notation.)

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Color, Munsell notation. A system for designating color by degrees of three simple variables—hue, value, and chroma. For example, the notation 10YR 6/4 stands for a color with a hue of 10YR, a value of 6, and a chroma of 4. Hue is the dominant spectral color; value relates to the relative lightness of color; chroma is the relative purity or strength of color and increases as grayness decreases.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose. Noncoherent; will not hold together in a mass.

Friable. When moist, soil crushes easily under gentle to moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Firm. When moist, soil crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic. When wet, soil is readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky. When wet, soil adheres to other material; tends to stretch somewhat and pull apart, rather than pull free from other material.

Hard. When dry, soil moderately resists pressure; can be broken with difficulty between thumb and forefinger.

Soft. When dry, soil breaks into powder or individual grains under very slight pressure.

Cemented. Hard and brittle; little affected by moistening.

Diversion. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course, and thus to protect areas downslope from the effects of such runoff.

Drainage, soil. The rapidity and extent of the removal of water from the soil, in relation to additions. Most water is removed by runoff, by flow through the soil to underground spaces, or by a combination of both processes.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic matter and clay but is rich in silt or very fine sand. The layer is seemingly cemented when dry, has a hard or very hard consistence, and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur 15 to 40 inches below the surface.

Gleization, or gleying. The reduction, translocation, and segregation of soil compounds, notably of iron, normally in the subsoil or substratum; a result of poor aeration and drainage, expressed in the soil by mottled colors dominated by gray.

Gravel. A mass of rounded or angular rock fragments ¼ inch to 3 inches in diameter.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes and that differs in one or more ways from adjacent horizons in the same profile. Soil horizons designated by capital letters are defined as follows:

A horizon.—The mineral horizon at the surface. It contains an accumulation of organic matter, has been leached of soluble minerals and clay, or shows the effects of both.

B horizon.—The horizon in which clay minerals have accumulated, that has developed a characteristic blocky or prismatic structure, or that shows the effects of both processes.

C horizon.—The unconsolidated material immediately under the true soil. In chemical, physical, and mineral composition it is presumed to be similar to the material from which at least part of the overlying solum has developed, unless the C designation is preceded by a Roman numeral.

Roman numerals are prefixed to the master horizon or layer designation (A, B, C, R) to indicate lithologic discontinuities either within or below the solum. The first, or uppermost, material is not numbered, for the Roman numeral I is understood; the second, or contrasting, material is numbered II, and others are numbered III, IV, and so on, consecutively downward. Thus for example, a sequence from the surface downward might be A1, B1, B2, C, IIC2.

Following are the small-letter symbols that may be a part of a horizon designation (B21tg) and the meaning of these symbols.

g—strong gleying.
h—illuvial humus.
p—plow layer.
t—illuvial clay.
x—fragipan character.

Hue. (See Color, Munsell notation.)

Interceptor. A drainage ditch or tile line, generally at or near the base of a slope, that protects areas downslope from the effects of seepage water.

Internal soil drainage. The downward movement of water through the soil profile. The rate of movement is determined by the texture, structure, and other characteristics of the soil profile and underlying layers, and by the height of water table, either permanent or perched. Relative terms for expressing internal drainage are *none, very slow, slow, medium, rapid,* and *very rapid.*

Loam. Soil having approximately equal amounts of sand, silt, and clay.

Morphology, soil. The physical constitution of the soil, including the texture, structure, consistence, color, and other physical and chemical properties of the various soil horizons that make up the soil profile.

Mottles. Patches of contrasting color that vary in number and size; generally associated with poor drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.*

Natural drainage. Refers to those conditions that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may result from other causes, such as natural deepening of channels or filling of depressions. The following terms are used to express natural drainage: *Excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained.*

Parent material. The weathered rock or partly weathered soil material from which a soil has formed; the C horizon.

Permeability. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material. (See Horizon, soil.)

Reaction, soil. The degree of acidity of alkalinity of a soil, expressed in pH values or in words as follows:

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5–5.0
Strongly acid	5.1–5.5
Medium acid	5.6–6.0
Slightly acid	6.1–6.5
Neutral	6.6–7.3
Mildly akaline	7.4–7.8
Moderately alkaline	7.9–8.4
Strongly alkaline	8.5–9.0
Very strongly akaline	9.1 and higher

Relief. (See Topography.)

Sand. As a soil separate, individual rock or mineral fragments 0.05 to 2.0 millimeters in diameter As a textural class, soil that is 85 percent or more sand and not more than 10 percent clay

Silt. As a soil separate, individual mineral particles 0.002 to 0.05 millimeter in diameter. As a textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Soil. The natural medium for the growth of land plants on the surface of the earth; composed of mineral and organic materials.

Solum. The genetic soil developed by soil-forming processes; the A and B horizons; does not include the parent material (C horizon).

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Substratum. Any layer lying beneath the solum, or true soil; the C or D horizon.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness.

Texture, soil. The relative proportions of sand, silt, and clay particles in the soil. A coarse-textured soil is one high in sand; a fine-textured soil contains a large proportion of clay. (See Sand, Silt, and Clay.)

Tilth, soil. The physical properties of the soil that affect the ease with which it can be cultivated or that affect its suitability for crops; implies the presence or absence of favorable soil structure.

Topography, or Relief. Elevations or inequalities of the land surface, considered collectively.

Upland (geologic). Land consisting of material unworked by water in recent geologic time and ordinarily lying at a higher elevation than flood plains and stream terraces.

Value. (See Color, Munsell notation.)

V-type ditches. Drainage ditches that are V-shaped and have smooth side slopes.

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U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
MARYLAND AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP
QUEEN ANNES COUNTY, MARYLAND

Scale 1:190,080

1 0 1 2 3 4 Miles

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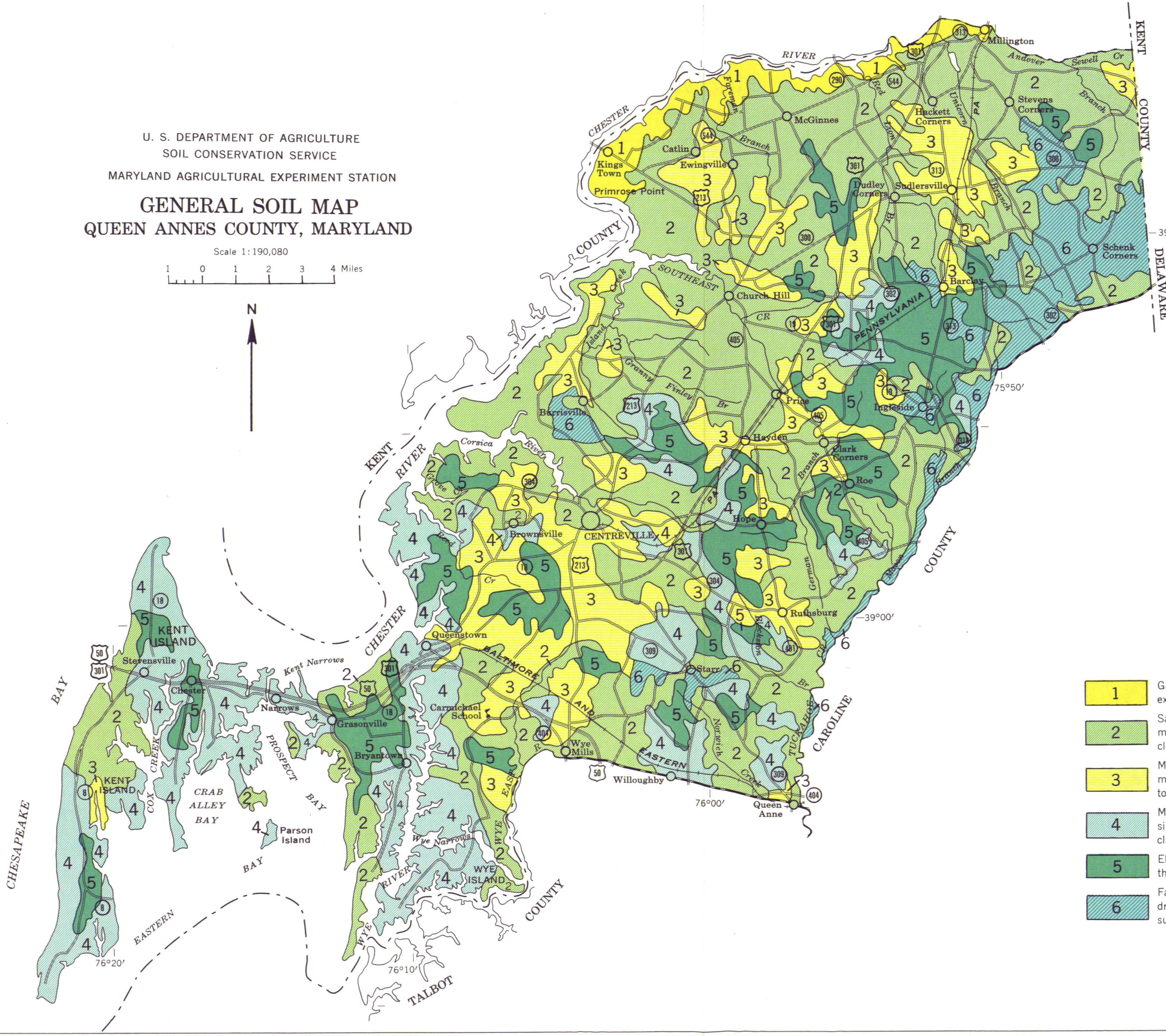

SOIL ASSOCIATIONS

1. Galestown-Lakeland-Downer association: Somewhat excessively or excessively drained sands and loamy sands
2. Sassafras-Woodstown association: Well drained and moderately well drained soils that have a friable sandy clay loam subsoil
3. Matapeake-Butlertown association: Well drained and moderately well drained silty soils that have a friable to firm silty clay loam subsoil
4. Mattapex-Keyport association: Moderately well drained silty soils that have a firm silty clay loam to plastic clay subsoil
5. Elkton-Othello association: Poorly drained silty soils that have a firm silty clay loam to plastic clay subsoil
6. Fallsington-Pocomoke association: Poorly and very poorly drained soils that have a friable to firm sandy clay loam subsoil

September 1965

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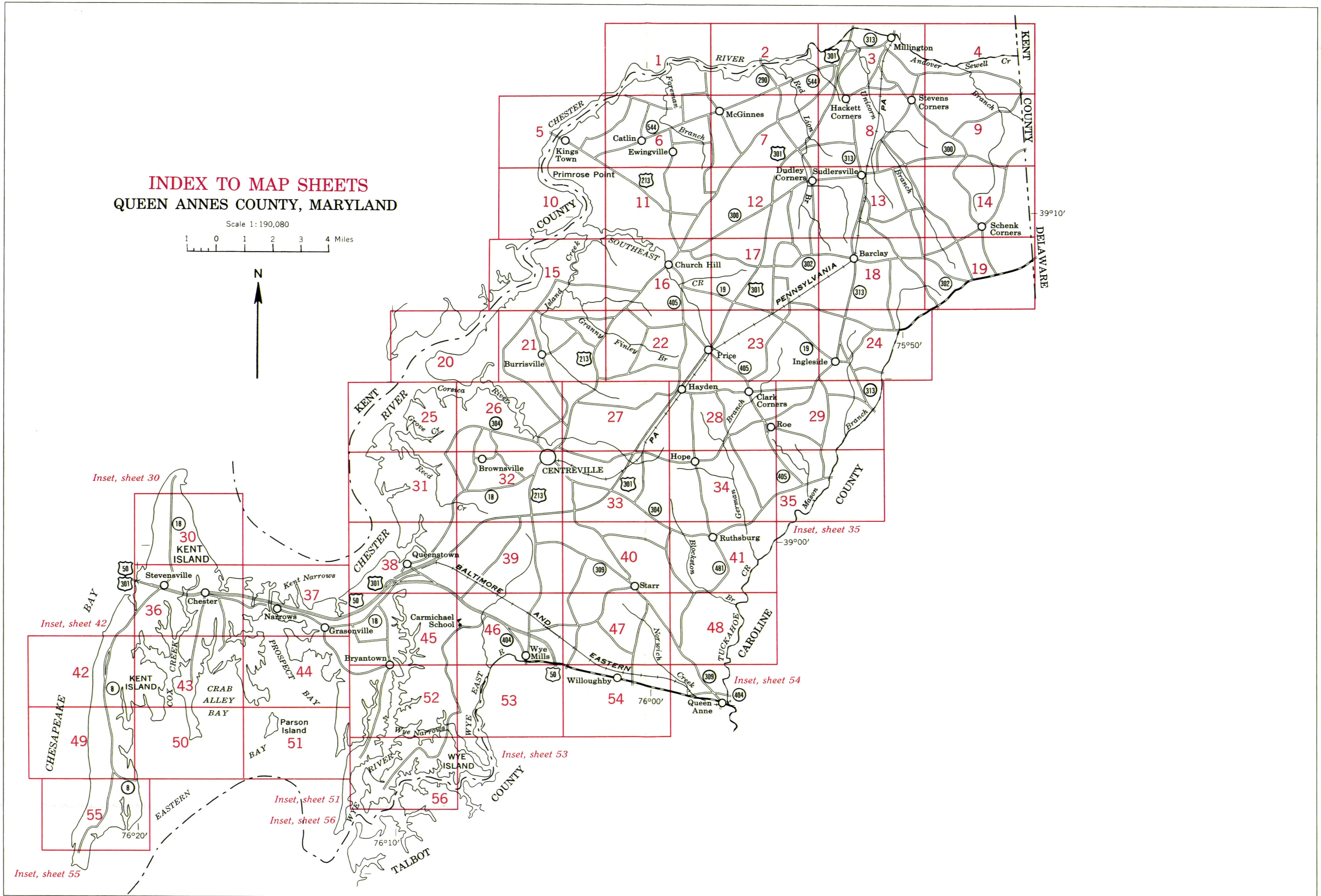
QUEEN ANNES COUNTY, MARYLAND

Scale 1:190,080



GUIDE TO MAPPING UNITS

[See table 4, p. 10, for approximate acreage and proportionate extent of each soil; see table 5, p. 40, for estimated yields of principal crops. See the section "Engineering Uses of Soils" for information on engineering properties. See table 14, p. 74, for drainage groups of soils and table 15, p. 78, for irrigation groups of soils]

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group	
			Symbol	Page	Group	Page
Ba	Bayboro silt loam	11	IIIw-9	34	1	43
BoA	Bertie and Othello silt loams, 0 to 2 percent slopes	11	IIIw-1	34	3	46
BoB2	Bertie and Othello silt loams, 2 to 5 percent slopes, moderately eroded	12	IIIw-1	34	3	46
Bp	Bibb silt loam	12	IIIw-7	34	2	46
Bt	Bladen silty clay loam	12	VIw-2	36	10	48
BuA	Butlertown silt loam, 0 to 2 percent slopes	13	IIw-1	32	11	48
BuB2	Butlertown silt loam, 2 to 5 percent slopes, moderately eroded	13	IIe-16	32	11	48
BuC2	Butlertown silt loam, 5 to 10 percent slopes, moderately eroded	13	IIIe-16	33	9	48
BuC3	Butlertown silt loam, 5 to 10 percent slopes, severely eroded	13	IVe-9	35	17	49
Cb	Coastal beaches	13	VIIIs-2	37	20	49
DoA	Downer loamy sand, 0 to 2 percent slopes	14	IIs-4	33	7	47
DoB	Downer loamy sand, 2 to 5 percent slopes	14	IIs-4	33	7	47
DoC	Downer loamy sand, 5 to 10 percent slopes	14	IIIe-33	34	8	47
DoC3	Downer loamy sand, 5 to 10 percent slopes, severely eroded	14	IVe-5	35	13	48
DoD	Downer loamy sand, 10 to 15 percent slopes	14	IVe-5	35	8	47
DoD3	Downer loamy sand, 10 to 15 percent slopes, severely eroded	14	VIe-2	36	13	48
DoE	Downer loamy sand, 15 to 30 percent slopes	14	VIe-2	36	9	48
Ek	Elkton loam	14	IIIw-9	34	1	43
EnA	Elkton silt loam, 0 to 2 percent slopes	15	IIIw-9	34	1	43
EnB2	Elkton silt loam, 2 to 5 percent slopes, moderately eroded	15	IIIw-9	34	1	43
FaA	Fallsington loam, 0 to 2 percent slopes	15	IIIw-7	34	1	43
FaB	Fallsington loam, 2 to 5 percent slopes	15	IIIw-7	34	1	43
FdA	Fallsington sandy loam, 0 to 2 percent slopes	15	IIIw-6	34	1	43
FdB	Fallsington sandy loam, 2 to 5 percent slopes	16	IIIw-6	34	1	43
GaB	Galestown loamy sand, clayey substratum, 0 to 5 percent slopes	16	IIIs-1	35	5	47
GaC	Galestown loamy sand, clayey substratum, 5 to 10 percent slopes	16	IVs-1	36	5	47
GcB	Galestown sand, clayey substratum, 0 to 5 percent slopes	16	IVs-1	36	5	47
GkD	Galestown and Lakeland loamy sands, 10 to 15 percent slopes	17	VIIs-1	37	5	47
GkE	Galestown and Lakeland loamy sands, 15 to 30 percent slopes	17	VIIs-1	37	6	47
GlC	Galestown and Lakeland sands, 5 to 10 percent slopes	17	VIIs-1	37	5	47
Gr	Gravel and borrow pits	17	VIIIs-4	37	21	49
Jo	Johnston loam	17	IIIw-7	34	2	46
KeA	Keyport loam, 0 to 2 percent slopes	18	IIw-8	32	11	48
KeB2	Keyport loam, 2 to 5 percent slopes, moderately eroded	18	IIe-13	32	11	48
KpA	Keyport silt loam, 0 to 2 percent slopes	18	IIw-8	32	11	48
KpB2	Keyport silt loam, 2 to 5 percent slopes, moderately eroded	18	IIe-13	32	11	48
KrC3	Keyport silty clay loam, 5 to 10 percent slopes, severely eroded	18	VIe-2	36	17	49
KrD3	Keyport silty clay loam, 10 to 15 percent slopes, severely eroded	18	VIIe-2	36	17	49
KsA	Klej loamy sand, 0 to 2 percent slopes	18	IIIw-10	34	3	46
KsB	Klej loamy sand, 2 to 5 percent slopes	19	IIIw-10	34	3	46
LaB	Lakeland loamy sand, clayey substratum, 0 to 5 percent slopes	19	IIIs-1	35	5	47
LaC	Lakeland loamy sand, clayey substratum, 5 to 10 percent slopes	19	IVs-1	36	5	47
Ma	Made land	19	------	--	21	49
MbA	Matapeake fine sandy loam, 0 to 2 percent slopes	20	I-5	31	7	47
MbB2	Matapeake fine sandy loam, 2 to 5 percent slopes, moderately eroded	20	IIe-5	32	7	47
MbC2	Matapeake fine sandy loam, 5 to 10 percent slopes, moderately eroded	20	IIIe-5	33	8	47
MbC3	Matapeake fine sandy loam, 5 to 10 percent slopes, severely eroded	20	IVe-5	35	13	48
McA	Matapeake loam, 0 to 2 percent slopes	20	I-4	31	7	47
McB2	Matapeake loam, 2 to 5 percent slopes, moderately eroded	20	IIe-4	31	7	47
McC2	Matapeake loam, 5 to 10 percent slopes, moderately eroded	20	IIIe-4	33	8	47
McC3	Matapeake loam, 5 to 10 percent slopes, severely eroded	20	IVe-3	35	13	48
MkA	Matapeake silt loam, 0 to 2 percent slopes	20	I-4	31	7	47
MkB2	Matapeake silt loam, 2 to 5 percent slopes, moderately eroded	20	IIe-4	31	7	47
MkC2	Matapeake silt loam, 5 to 10 percent slopes, moderately eroded	20	IIIe-4	33	8	47
MkC3	Matapeake silt loam, 5 to 10 percent slopes, severely eroded	20	IVe-3	35	13	48
MmD	Matapeake soils, 10 to 15 percent slopes	21	IVe-3	35	8	47
MmD3	Matapeake soils, 10 to 15 percent slopes, severely eroded	21	VIe-2	36	13	48
MmE	Matapeake soils, 15 to 30 percent slopes	21	VIe-2	36	9	48
MoA	Matapeake silt loam, silty substratum, 0 to 2 percent slopes	21	I-4	31	7	47
MoB2	Matapeake silt loam, silty substratum, 2 to 5 percent slopes, moderately eroded	21	IIe-4	31	7	47
MoC2	Matapeake silt loam, silty substratum, 5 to 10 percent slopes, moderately eroded	21	IIIe-4	33	8	47
MoC3	Matapeake silt loam, silty substratum, 5 to 10 percent slopes, severely eroded	21	IVe-3	35	13	48
MpA	Mattapex fine sandy loam, 0 to 2 percent slopes	22	IIw-5	32	11	48
MpB2	Mattapex fine sandy loam, 2 to 5 percent slopes, moderately eroded	22	IIe-36	32	11	48
MsA	Mattapex loam, 0 to 2 percent slopes	22	IIw-1	32	11	48
MsB2	Mattapex loam, 2 to 5 percent slopes, moderately eroded	22	IIe-16	32	11	48
MsC2	Mattapex loam, 5 to 10 percent slopes, moderately eroded	22	IIIe-16	33	9	48
MsC3	Mattapex loam, 5 to 10 percent slopes, severely eroded	22	IVe-9	35	17	49
MtA	Mattapex silt loam, 0 to 2 percent slopes	22	IIw-1	32	11	48
MtB2	Mattapex silt loam, 2 to 5 percent slopes, moderately eroded	22	IIe-16	32	11	48
MtC2	Mattapex silt loam, 5 to 10 percent slopes, moderately eroded	22	IIIe-16	33	9	48
MtC3	Mattapex silt loam, 5 to 10 percent slopes, severely eroded	22	IVe-9	35	17	49
MxD	Mattapex soils, 10 to 15 percent slopes	22	IVe-9	35	9	48
MxD3	Mattapex soils, 10 to 15 percent slopes, severely eroded	23	VIe-2	36	17	49
MxE	Mattapex soils, 15 to 30 percent slopes	23	VIe-2	36	9	48
My	Mixed alluvial land	23	VIw-1	36	2	46
ObA	Othello silt loam, 0 to 2 percent slopes	24	IIIw-7	34	10	48
ObB2	Othello silt loam, 2 to 5 percent slopes, moderately eroded	24	IIIw-7	34	10	48
OeC2	Othello and Elkton soils, 5 to 10 percent slopes, moderately eroded	24	IIIe-13	33	10	48
Pd	Plummer loamy sand	24	IVw-6	35	10	48
Pk	Pocomoke loam	25	IIIw-7	34	1	43
Pm	Pocomoke sandy loam	25	IIIw-6	34	1	43
Po	Portsmouth silt loam	25	IIIw-7	34	1	43
SaA	Sassafras loam, 0 to 2 percent slopes	25	I-4	31	7	47
SaB2	Sassafras loam, 2 to 5 percent slopes, moderately eroded	26	IIe-4	31	7	47
SaC2	Sassafras loam, 5 to 10 percent slopes, moderately eroded	26	IIIe-4	33	8	47
SaC3	Sassafras loam, 5 to 10 percent slopes, severely eroded	26	IVe-3	35	13	48
SaD2	Sassafras loam, 10 to 15 percent slopes, moderately eroded	26	IVe-3	35	8	47
SaD3	Sassafras loam, 10 to 15 percent slopes, severely eroded	26	VIe-2	36	13	48
SaE	Sassafras loam, 15 to 30 percent slopes	26	VIe-2	36	9	48
SfA	Sassafras sandy loam, 0 to 2 percent slopes	26	I-5	31	7	47
SfB2	Sassafras sandy loam, 2 to 5 percent slopes, moderately eroded	26	IIe-5	32	7	47
SfC2	Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded	26	IIIe-5	33	8	47
SfC3	Sassafras sandy loam, 5 to 10 percent slopes, severely eroded	26	IVe-5	35	13	48
SfD2	Sassafras sandy loam, 10 to 15 percent slopes, moderately eroded	27	IVe-5	35	8	47
SfD3	Sassafras sandy loam, 10 to 15 percent slopes, severely eroded	27	VIe-2	36	13	48
SfE	Sassafras sandy loam, 15 to 30 percent slopes	27	VIe-2	36	9	48
SfE3	Sassafras sandy loam, 15 to 30 percent slopes, severely eroded	27	VIIe-2	36	13	48
SfF	Sassafras sandy loam, 30 to 60 percent slopes	27	VIIe-2	36	9	48
Sw	Swamp	27	VIIw-1	37	21	49
Tm	Tidal marsh	27	VIIIw-1	37	21	49
WdA	Woodstown loam, 0 to 2 percent slopes	28	IIw-1	32	3	46
WdB2	Woodstown loam, 2 to 5 percent slopes, moderately eroded	28	IIe-16	32	3	46
WoA	Woodstown sandy loam, 0 to 2 percent slopes	29	IIw-5	32	3	46
WoB2	Woodstown sandy loam, 2 to 5 percent slopes, moderately eroded	29	IIe-36	32	3	46
WoC2	Woodstown sandy loam, 5 to 10 percent slopes, moderately eroded	29	IIIe-36	34	9	48
WoD	Woodstown sandy loam, 10 to 15 percent slopes	29	IVe-5	35	9	48
WoE	Woodstown sandy loam, 15 to 30 percent slopes	29	VIe-2	36	9	48

795 - 646 O - 66 (Face p. 118)

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, or F, shows the slope. Most symbols without a slope letter are for nearly level soils or land types, but some are for soils or land types that have considerable range in slope, A final number, 2 or 3, in a symbol means that the soil is moderately or severely eroded.

SYMBOL	NAME
Ba	Bayboro silt loam
BoA	Bertie and Othello silt loams, 0 to 2 percent slopes
BoB2	Bertie and Othello silt loams, 2 to 5 percent slopes, moderately eroded
Bp	Bibb silt loam
Bt	Bladen silty clay loam
BuA	Butlertown silt loam, 0 to 2 percent slopes
BuB2	Butlertown silt loam, 2 to 5 percent slopes, moderately eroded
BuC2	Butlertown silt loam, 5 to 10 percent slopes, moderately eroded
BuC3	Butlertown silt loam, 5 to 10 percent slopes, severely eroded
Cb	Coastal beaches
DoA	Downer loamy sand, 0 to 2 percent slopes
DoB	Downer loamy sand, 2 to 5 percent slopes
DoC	Downer loamy sand, 5 to 10 percent slopes
DoC3	Downer loamy sand, 5 to 10 percent slopes, severely eroded
DoD	Downer loamy sand, 10 to 15 percent slopes
DoD3	Downer loamy sand, 10 to 15 percent slopes, severely eroded
DoE	Downer loamy sand, 15 to 30 percent slopes
Ek	Elkton loam
EnA	Elkton silt loam, 0 to 2 percent slopes
EnB2	Elkton silt loam, 2 to 5 percent slopes, moderately eroded
FaA	Fallsington loam, 0 to 2 percent slopes
FaB	Fallsington loam, 2 to 5 percent slopes
FdA	Fallsington sandy loam, 0 to 2 percent slopes
FdB	Fallsington sandy loam, 2 to 5 percent slopes
GaB	Galestown loamy sand, clayey substratum, 0 to 5 percent slopes
GaC	Galestown loamy sand, clayey substratum, 5 to 10 percent slopes
GcB	Galestown sand, clayey substratum, 0 to 5 percent slopes
GkD	Galestown and Lakeland loamy sands, 10 to 15 percent slopes
GkE	Galestown and Lakeland loamy sands, 15 to 30 percent slopes
GlC	Galestown and Lakeland sands, 5 to 10 percent slopes
Gr	Gravel and borrow pits
Jo	Johnston loam
KeA	Keyport loam, 0 to 2 percent slopes
KeB2	Keyport loam, 2 to 5 percent slopes, moderately eroded
KpA	Keyport silt loam, 0 to 2 percent slopes
KpB2	Keyport silt loam, 2 to 5 percent slopes, moderately eroded
KrC3	Keyport silty clay loam, 5 to 10 percent slopes, severely eroded
KrD3	Keyport silty clay loam, 10 to 15 percent slopes, severely eroded
KsA	Klej loamy sand, 0 to 2 percent slopes
KsB	Klej loamy sand, 2 to 5 percent slopes
LaB	Lakeland loamy sand, clayey substratum, 0 to 5 percent slopes
LaC	Lakeland loamy sand, clayey substratum, 5 to 10 percent slopes
Ma	Made land
MbA	Matapeake fine sandy loam, 0 to 2 percent slopes
MbB2	Matapeake fine sandy loam, 2 to 5 percent slopes, moderately eroded
MbC2	Matapeake fine sandy loam, 5 to 10 percent slopes, moderately eroded
MbC3	Matapeake fine sandy loam, 5 to 10 percent slopes, severely eroded
McA	Matapeake loam, 0 to 2 percent slopes
McB2	Matapeake loam, 2 to 5 percent slopes, moderately eroded
McC2	Matapeake loam, 5 to 10 percent sloes, moderately eroded
McC3	Matapeake loam, 5 to 10 percent slopes, severely eroded
MkA	Matapeake silt loam, 0 to 2 percent slopes
MkB2	Matapeake silt loam, 2 to 5 percent slopes, moderately eroded
MkC2	Matapeake silt loam, 5 to 10 percent slopes, moderately eroded
MkC3	Matapeake silt loam, 5 to 10 percent slopes, severely eroded
MmD	Matapeake soils, 10 to 15 percent slopes
MmD3	Matapeake soils, 10 to 15 percent slopes, severely eroded
MmE	Matapeake soils, 15 to 30 percent slopes
MoA	Matapeake silt loam, silty substratum, 0 to 2 percent slopes
MoB2	Matapeake silt loam, silty substratum, 2 to 5 percent slopes, moderately eroded
MoC2	Matapeake silt loam, silty substratum, 5 to 10 percent slopes, moderately eroded
MoC3	Matapeake silt loam, silty substratum, 5 to 10 percent slopes, severely eroded
MpA	Mattapex fine sandy loam, 0 to 2 percent slopes
MpB2	Mattapex fine sandy loam, 2 to 5 percent slopes, moderately eroded
MsA	Mattapex loam, 0 to 2 percent slopes
MsB2	Mattapex loam, 2 to 5 percent slopes, moderately eroded
MsC2	Mattapex loam, 5 to 10 percent slopes, moderately eroded
MsC3	Mattapex loam, 5 to 10 percent slopes, severely eroded
MtA	Mattapex silt loam, 0 to 2 percent slopes
MtB2	Mattapex silt loam, 2 to 5 percent slopes, moderately eroded
MtC2	Mattapex silt loam, 5 to 10 percent slopes, moderately eroded
MtC3	Mattapex silt loam, 5 to 10 percent slopes, severely eroded
MxD	Mattapex soils, 10 to 15 percent slopes
MxD3	Mattapex soils, 10 to 15 percent slopes, severely eroded
MxE	Mattapex soils, 15 to 30 percent slopes
My	Mixed alluvial land
ObA	Othello silt loam, 0 to 2 percent slopes
ObB2	Othello silt loam, 2 to 5 percent slopes, moderately eroded
OeC2	Othello and Elkton soils, 5 to 10 percent slopes, moderately eroded
Pd	Plummer loamy sand
Pk	Pocomoke loam
Pm	Pocomoke sandy loam
Po	Portsmouth silt loam
SaA	Sassafras loam, 0 to 2 percent slopes
SaB2	Sassafras loam, 2 to 5 percent slopes, moderately eroded
SaC2	Sassafras loam, 5 to 10 percent slopes, moderately eroded
SaC3	Sassafras loam, 5 to 10 percent slopes severely eroded
SaD2	Sassafras loam, 10 to 15 percent slopes, moderately eroded
SaD3	Sassafras loam, 10 to 15 percent slopes, severely eroded
SaE	Sassafras loam, 15 to 30 percent slopes
SfA	Sassafras sandy loam, 0 to 2 percent slopes
SfB2	Sassafras sandy loam, 2 to 5 percent slopes, moderately eroded
SfC2	Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded
SfC3	Sassafras sandy loam, 5 to 10 percent slopes, severely eroded
SfD2	Sassafras sandy loam, 10 to 15 percent slopes, moderately eroded
SfD3	Sassafras sandy loam, 10 to 15 percent slopes, severely eroded
SfE	Sassafras sandy loam, 15 to 30 percent slopes
SfE3	Sassafras sandy loam, 15 to 30 percent slopes, severely eroded
SfF	Sassafras sandy loam, 30 to 60 percent slopes
Sw	Swamp
Tm	Tidal marsh
WdA	Woodstown loam, 0 to 2 percent slopes
WdB2	Woodstown loam, 2 to 5 percent slopes, moderately eroded
WoA	Woodstown sandy loam, 0 to 2 percent slopes
WoB2	Woodstown sandy loam, 2 to 5 percent slopes, moderately eroded
WoC2	Woodstown sandy loam, 5 to 10 percent slopes, moderately eroded
WoD	Woodstown sandy loam, 10 to 15 percent slopes
WoE	Woodstown sandy loam, 15 to 30 percent slopes

Soil map constructed 1965 by Cartographic Division, Soil Conservation Service, USDA, from 1957 aerial photographs. Controlled mosaic based on Maryland plane coordinate system, Lambert conformal conic projection, 1927 North American datum.

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 1

1

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 2

N

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

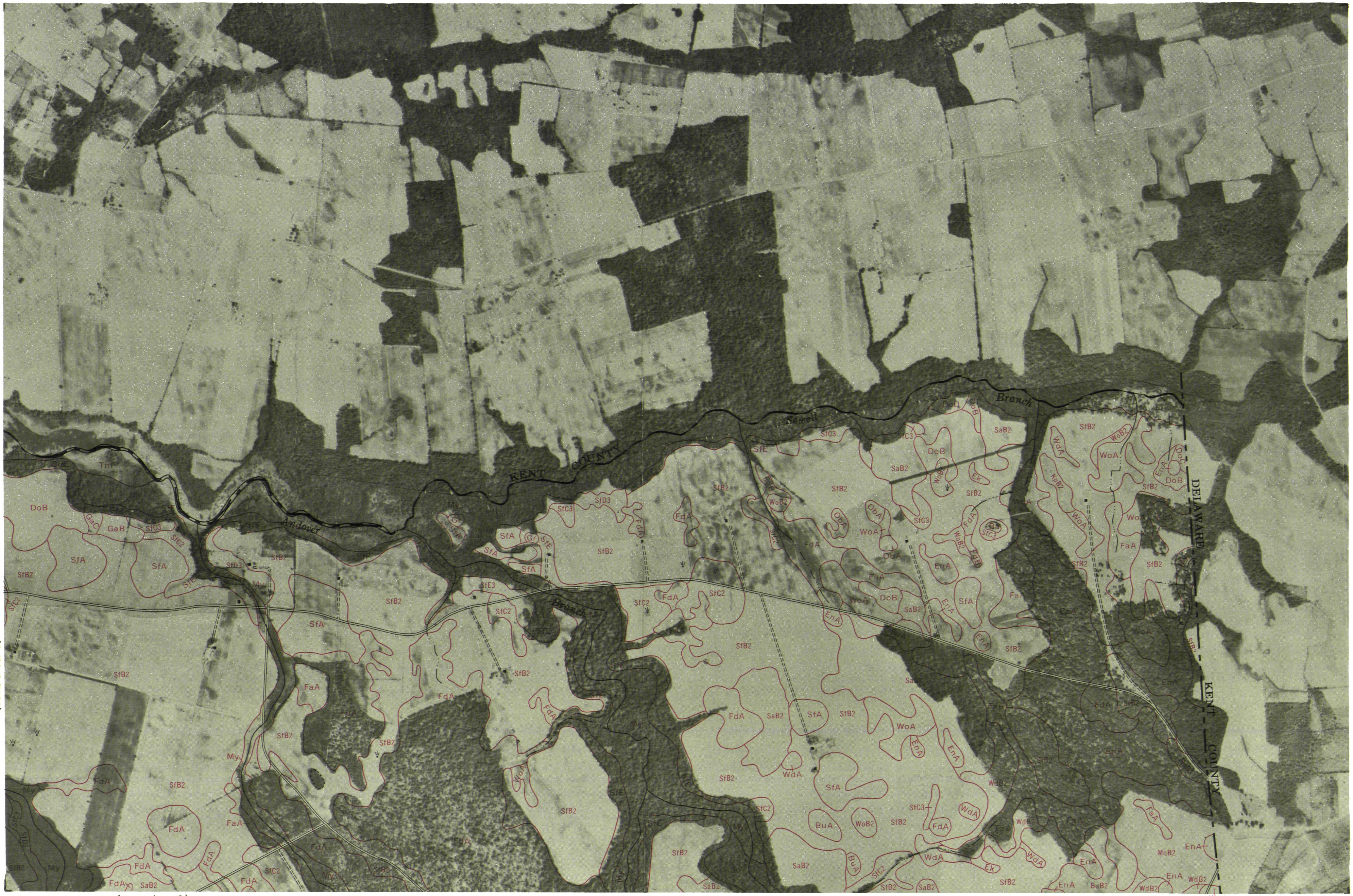
(Joins sheet 2)

(Joins sheet 4)

(Joins sheet 8)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

N

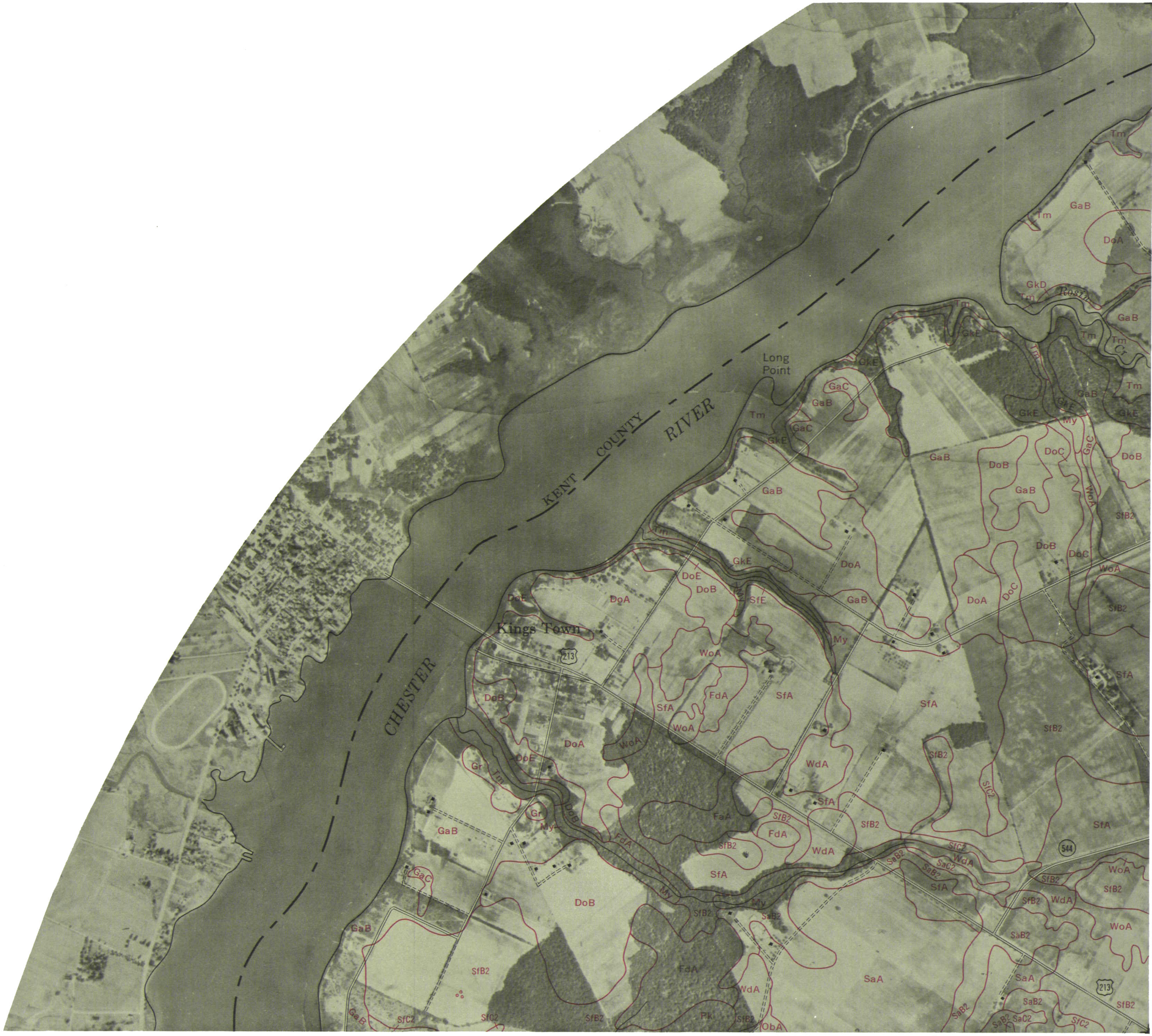


(Joins sheet 3)

(Joins sheet 9)

0 ½ 1 Mile
Scale 1:15 840
0 5000 Feet

N



(Joins sheet 6)

(Joins sheet 10)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

(Joins sheet 1)

N

(Joins sheet 5)

(Joins sheet 7)

(Joins sheet 11)

0 ½ 1 Mile

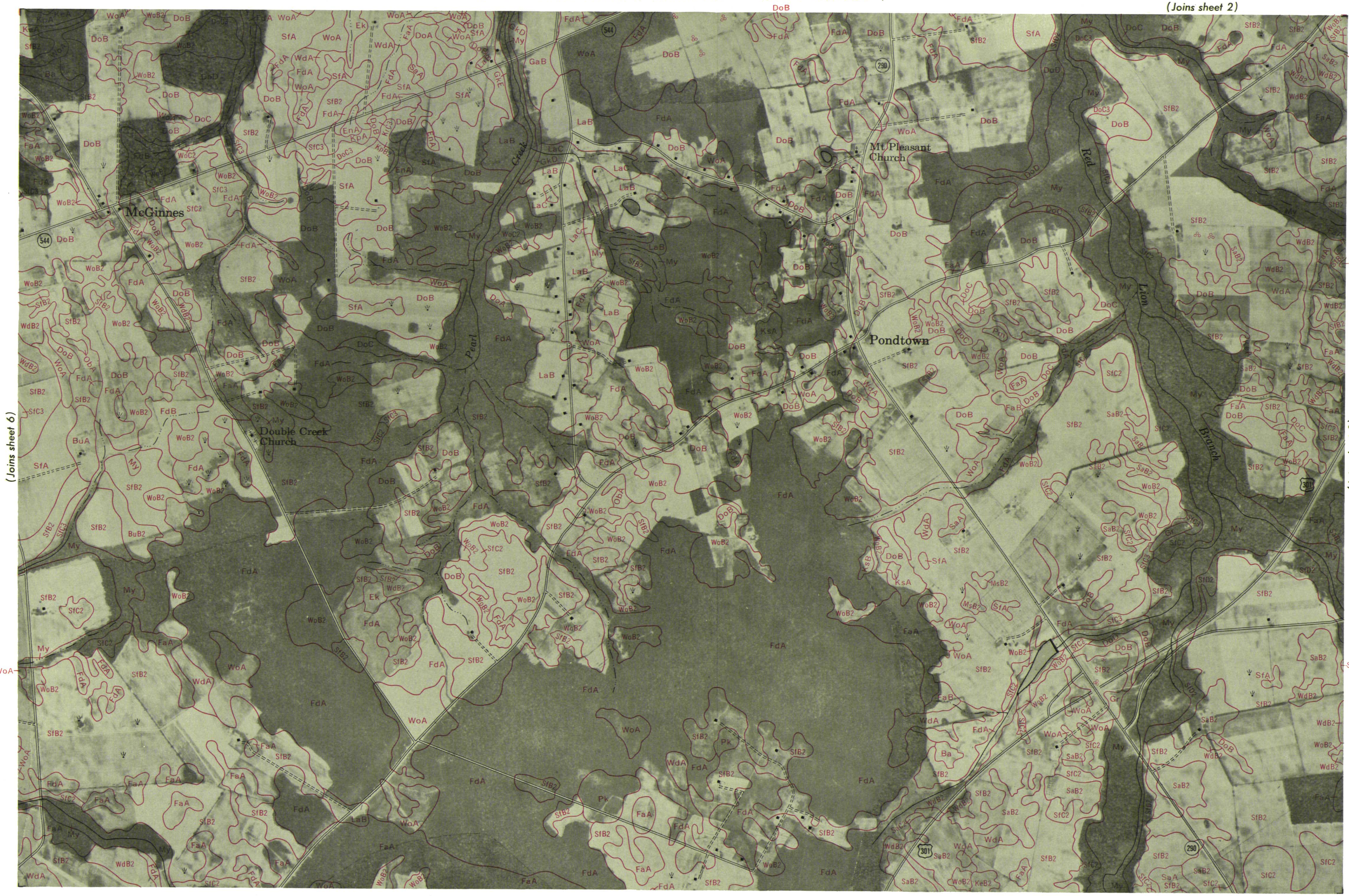
Scale 1:15 840

0 5000 Feet

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 7

(Joins sheet 2)

7



(Joins sheet 6)

(Joins sheet 8)

(Joins sheet 12)

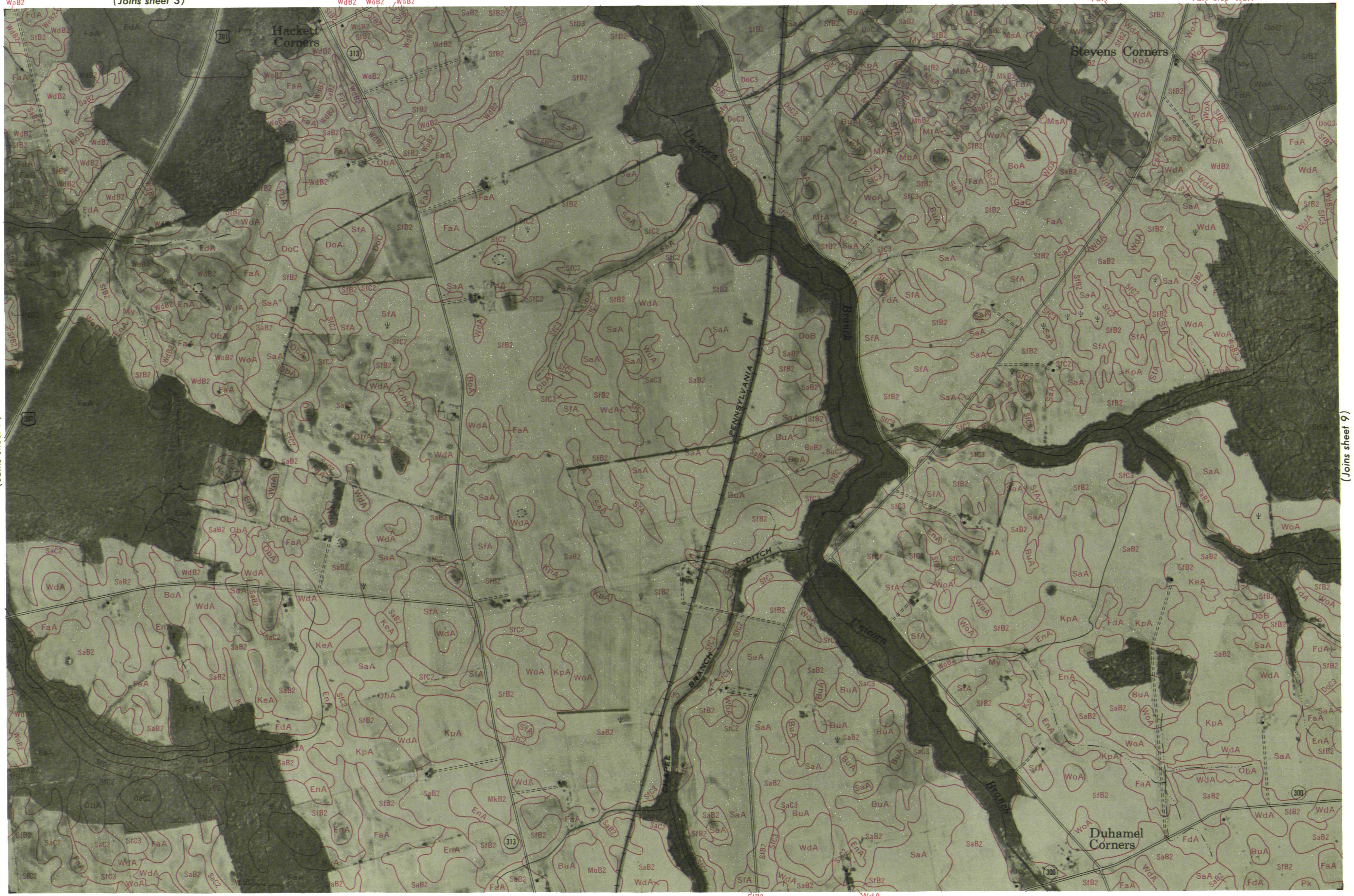
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 8

8

(Joins sheet 3)



(Joins sheet 7)

(Joins sheet 9)

(Joins sheet 13)

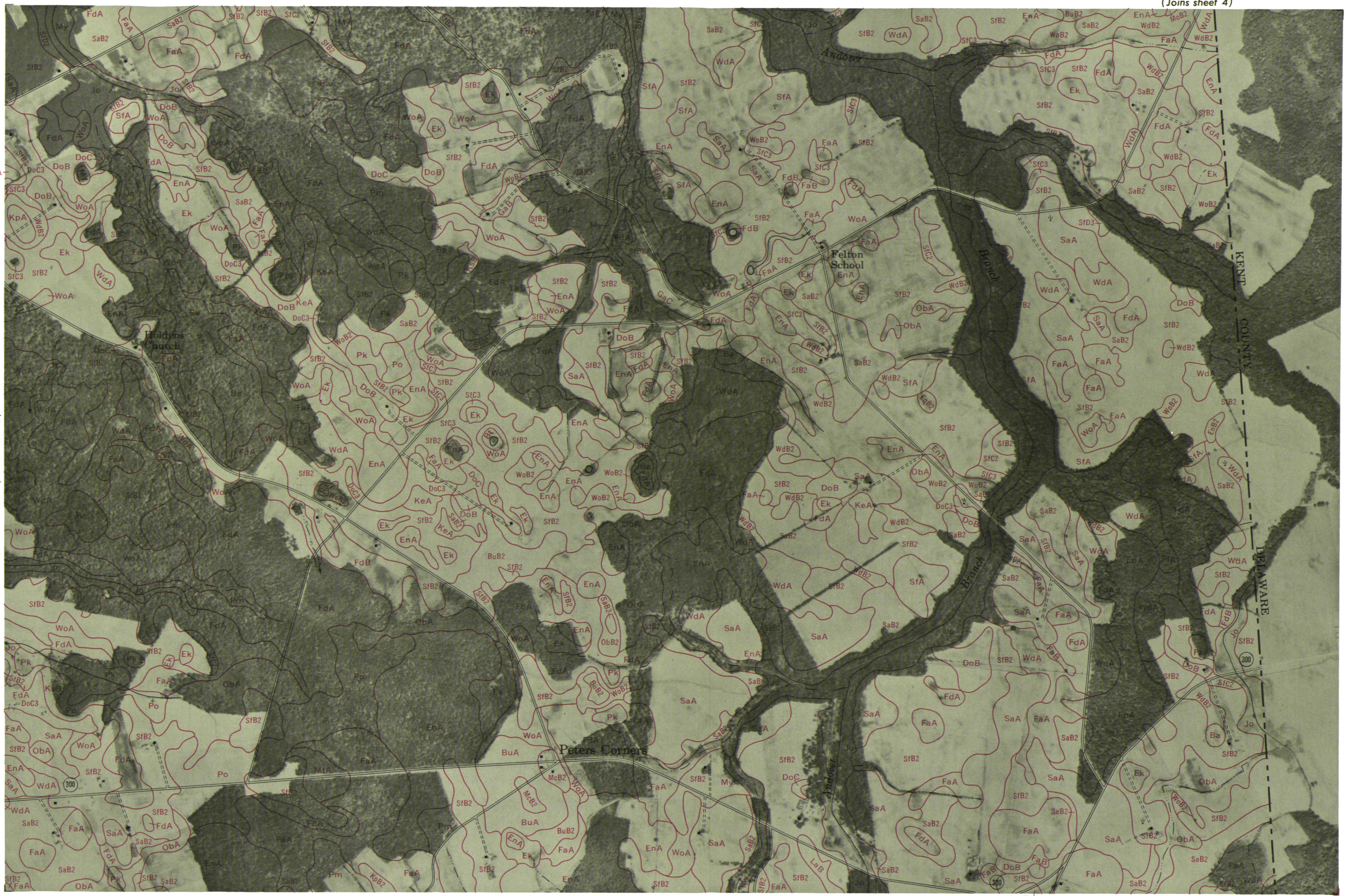
0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

(Joins sheet 4)

9

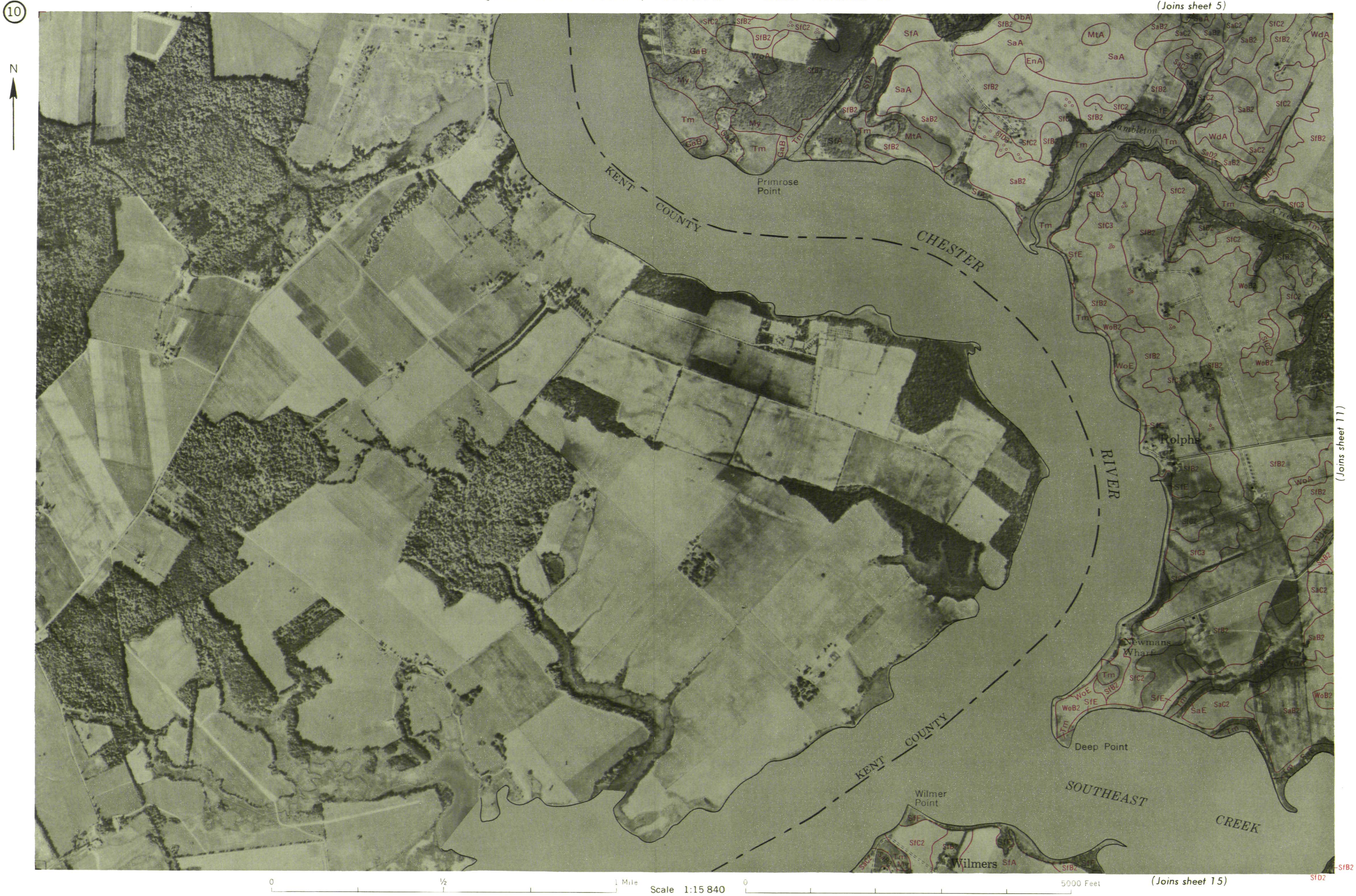


(Joins sheet 14)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

10


N
(Joins sheet 5)
(Joins sheet 11)
(Joins sheet 15)
KENT COUNTY
CHESTER
RIVER
Primrose Point
Rolphs
Newmans Wharf
Deep Point
Wilmer Point
Wilmers
SOUTHEAST
CREEK
KENT COUNTY
0
½
1 Mile
Scale 1:15 840
0
5000 Feet

(Joins sheet 6)

11

N

(Joins sheet 10)

(Joins sheet 12)

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

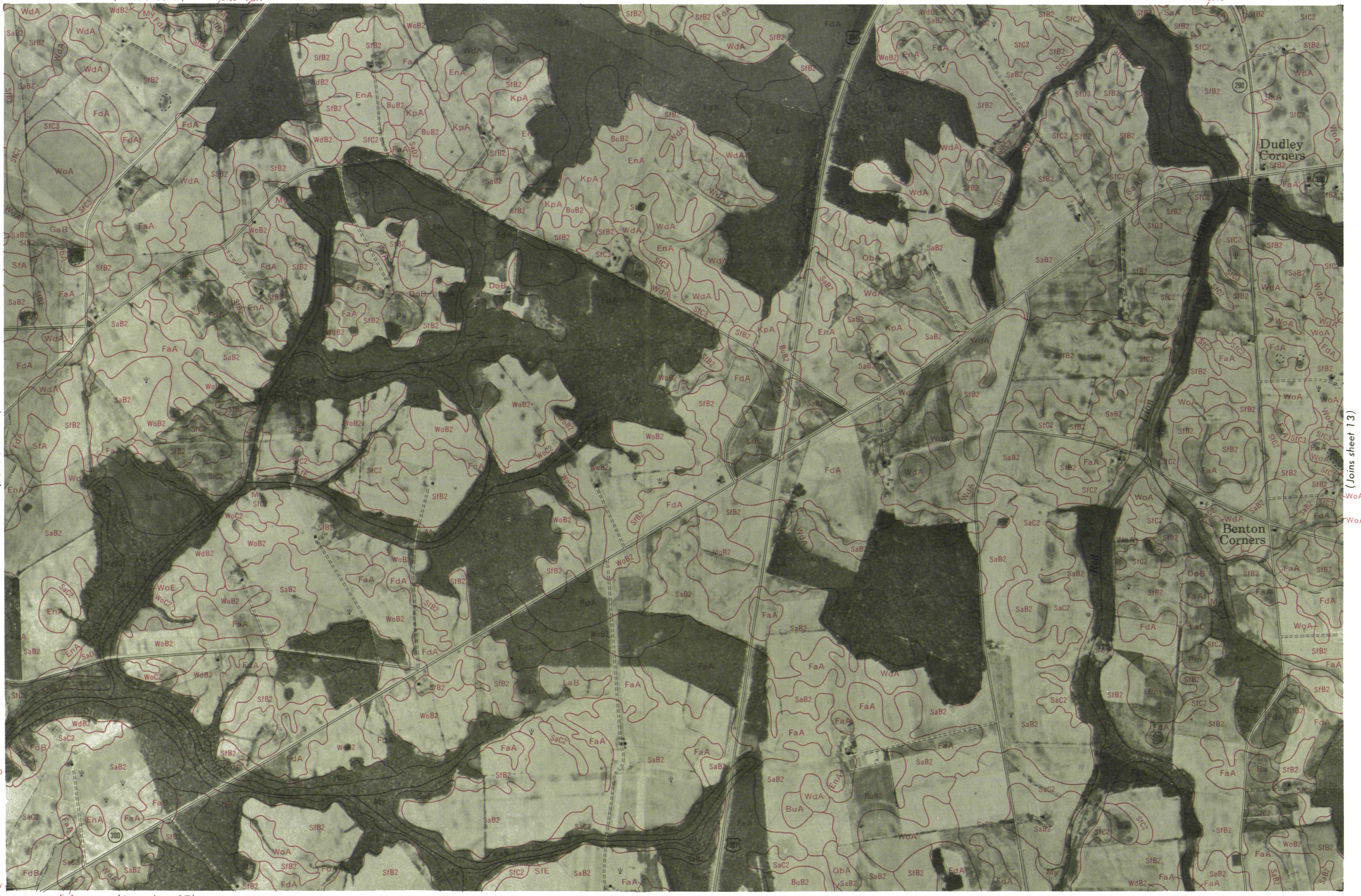
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 16)

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 12

(Joins sheet 7)

(Joins sheet 11)



(Joins sheet 13)

(Joins sheet 17)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 8)

13

(Joins sheet 12)

(Joins sheet 14)

(Joins sheet 18)

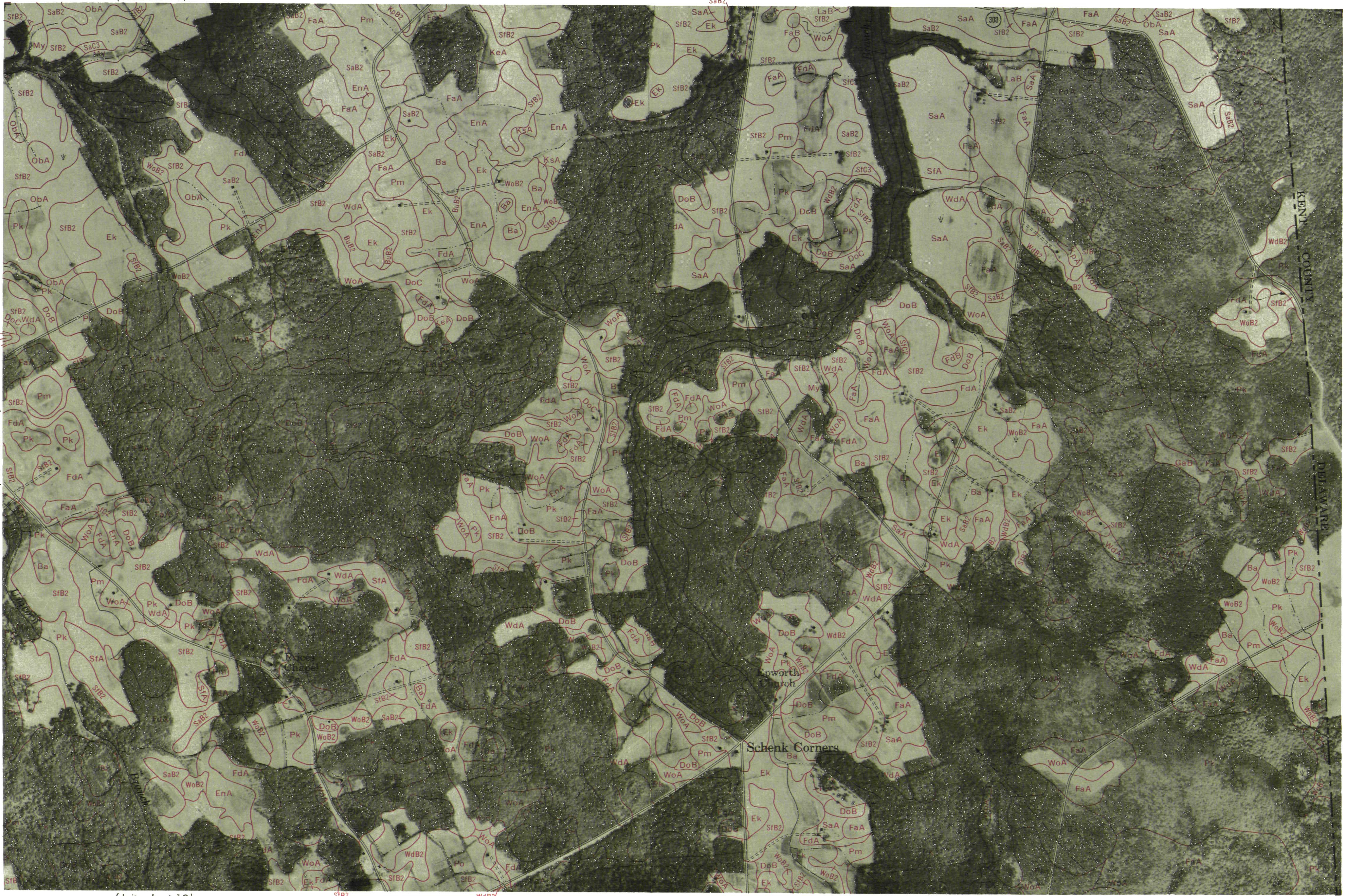
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

(Joins sheet 9)

N

(Joins sheet 13)

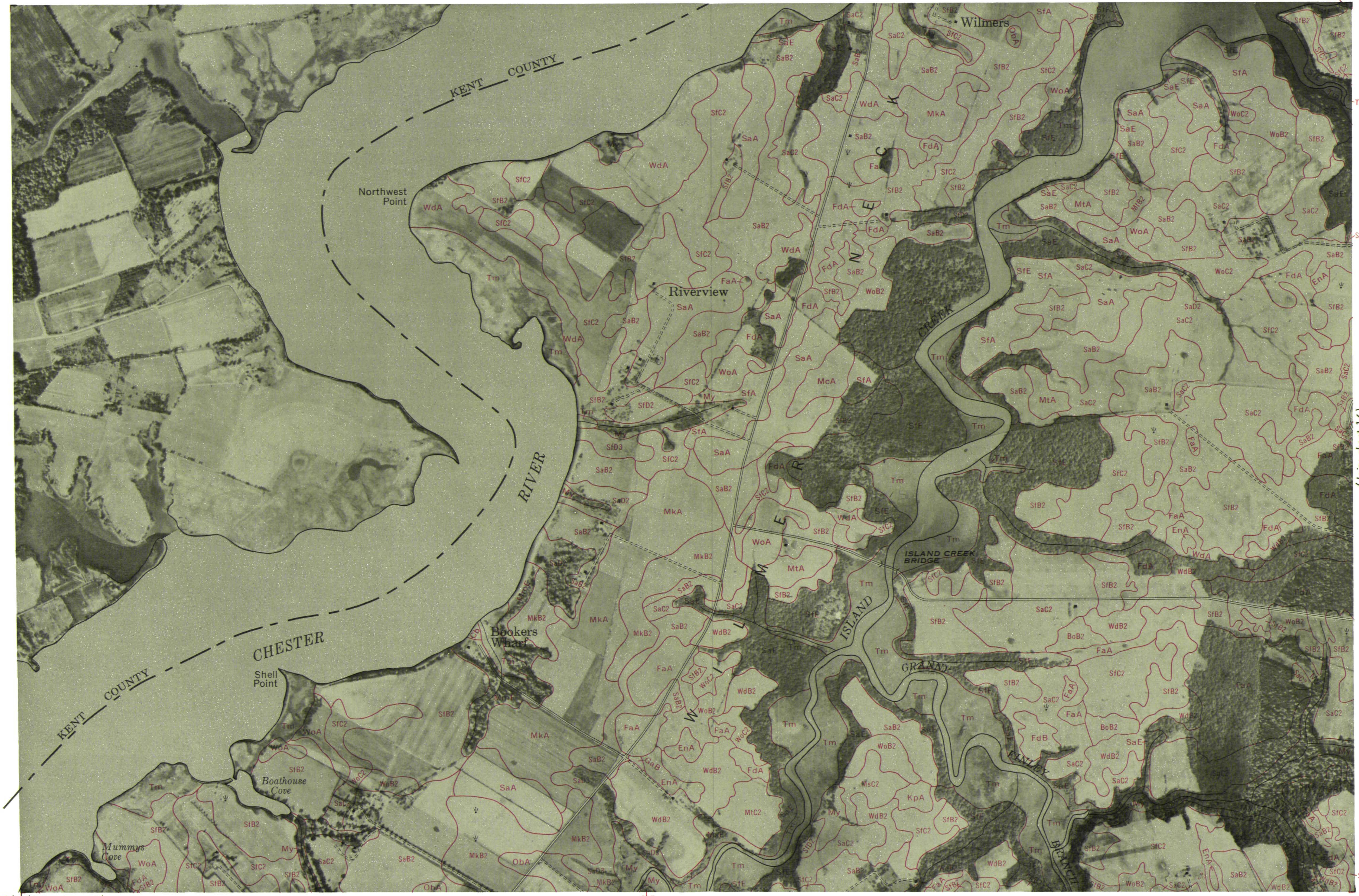


(Joins sheet 19)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 10)

15



(Joins sheet 16)

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

(Joins sheet 20) (Joins sheet 21)

0 ½ 1 Mile

Scale 1:15 840

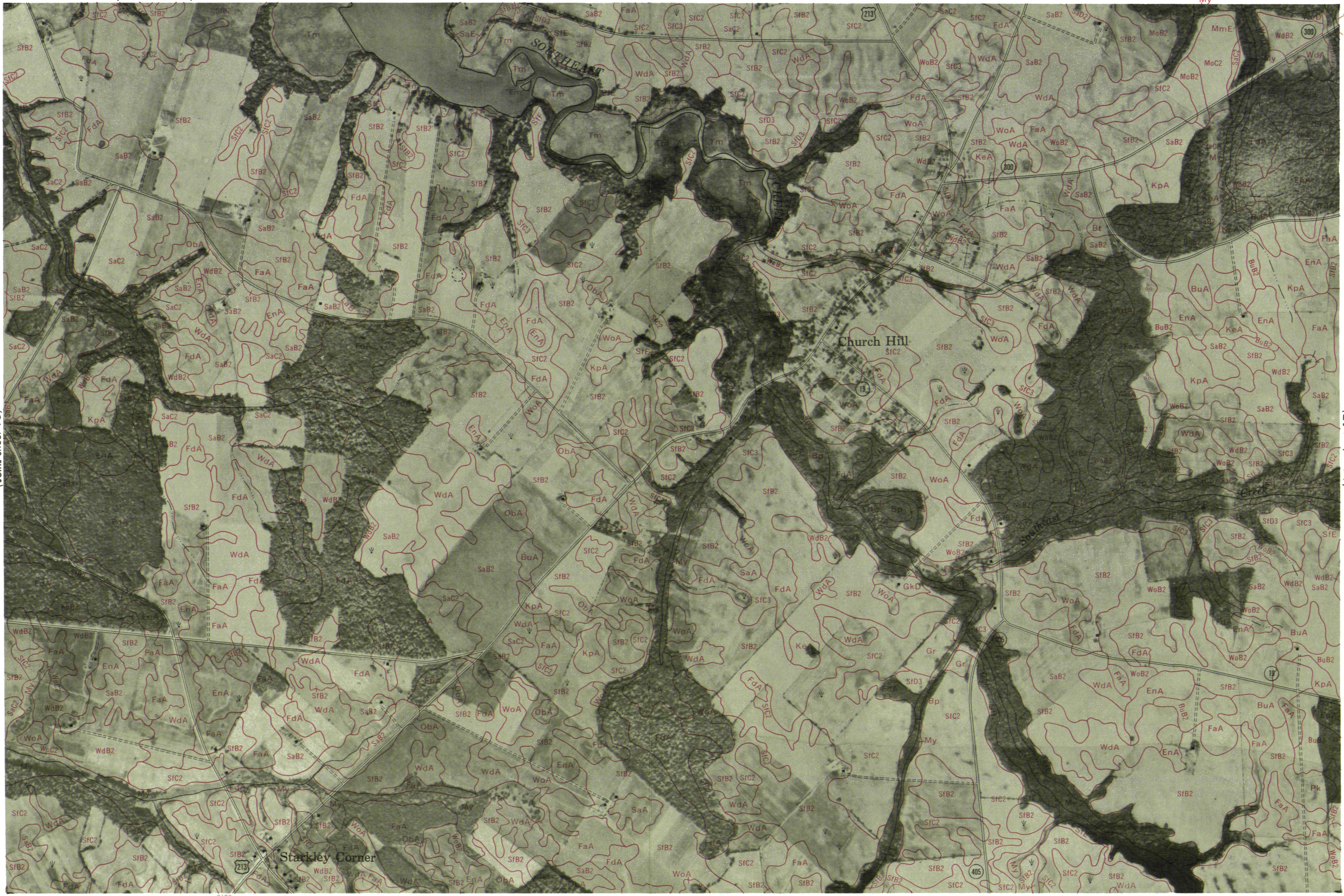
0 5000 Feet

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 16

(Joins sheet 11)

N

(Joins sheet 15)



(Joins sheet 17)

(Joins sheet 22)

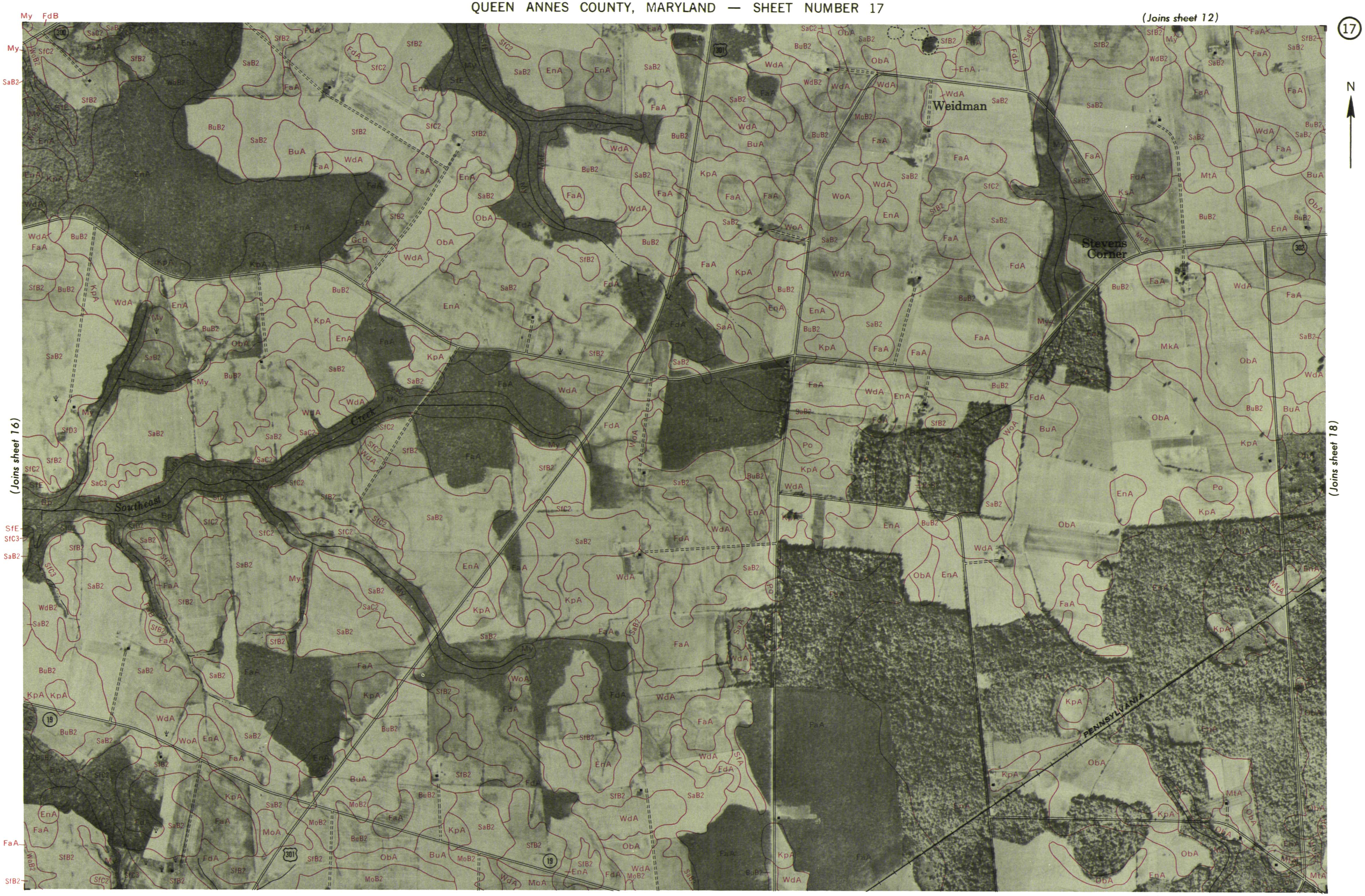
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 12)

17

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

(Joins sheet 16)



(Joins sheet 18)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 23)

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 18

(Joins sheet 13)

N

(Joins sheet 17)

(Joins sheet 19)

(Joins sheet 24)

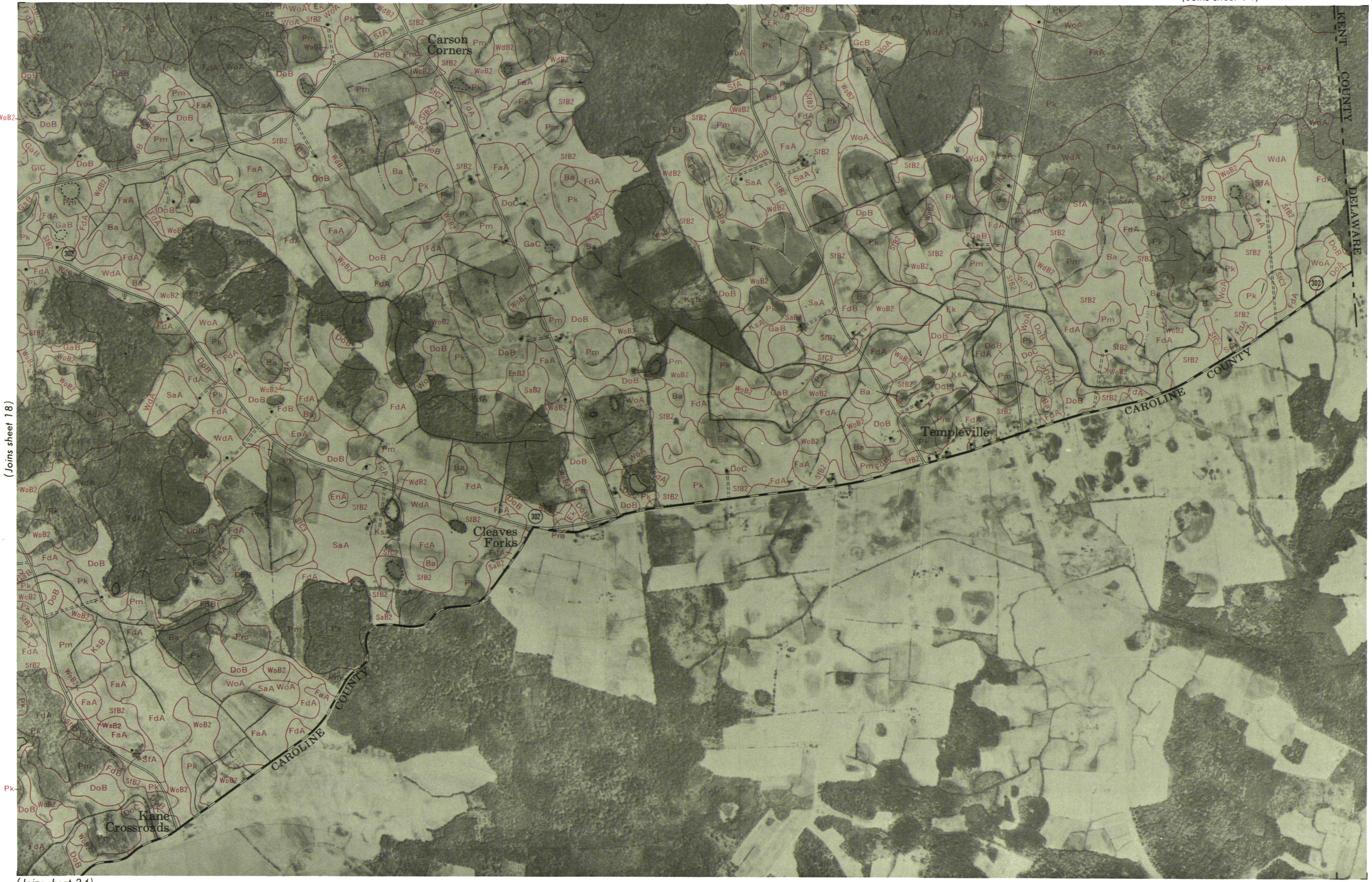
0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

(Joins sheet 14)

19



(Joins sheet 18)

(Joins sheet 24)

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

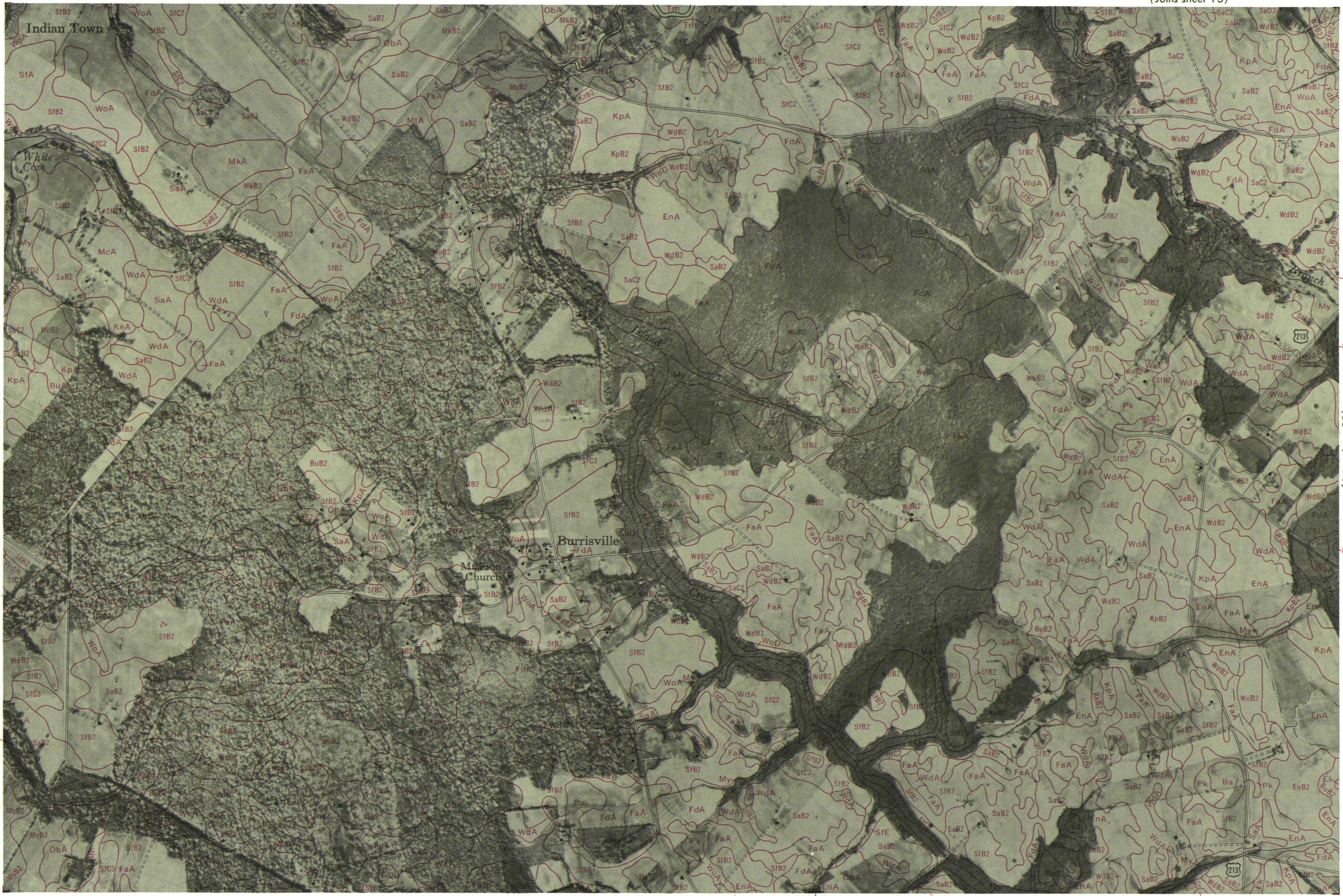

20
N
(Joins sheet 15)
(Joins sheet 21)
(Joins sheet 25) | (Joins sheet 26)
CHESTER RIVER
KENT COUNTY
SPANIARD NECK
Spaniard Point
White Cove
Emory Creek
0 ½ 1 Mile
Scale 1:15 840
0 5000 Feet

(Joins sheet 15)

21

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

(Joins sheet 20)



(Joins sheet 22)

(Joins sheet 26) | (Joins sheet 27)

0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

22

(Joins sheet 16)

N

(Joins sheet 21)

(Joins sheet 23)

(Joins sheet 27) | (Joins sheet 28)

0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

(Joins sheet 17)

23

N

(Joins sheet 22)

(Joins sheet 24)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 28) | (Joins sheet 29)

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 24

24

(Joins sheet 18) (Joins sheet 19)

N

(Joins sheet 23)

(Joins sheet 29)

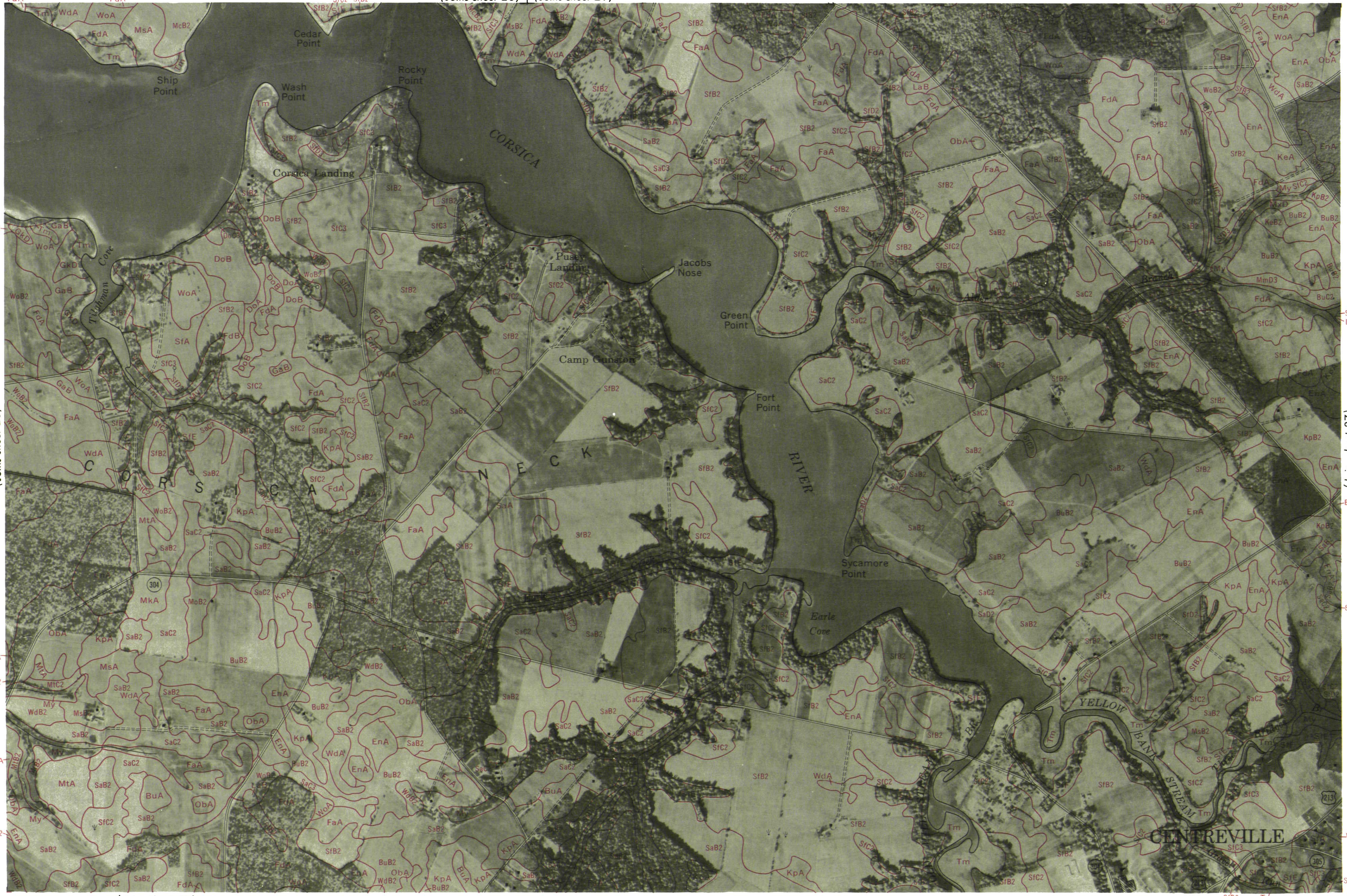
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 26

26

(Joins sheet 20) | (Joins sheet 21)



(Joins sheet 25)

(Joins sheet 27)

(Joins sheet 32)

0 ½ 1 Mile

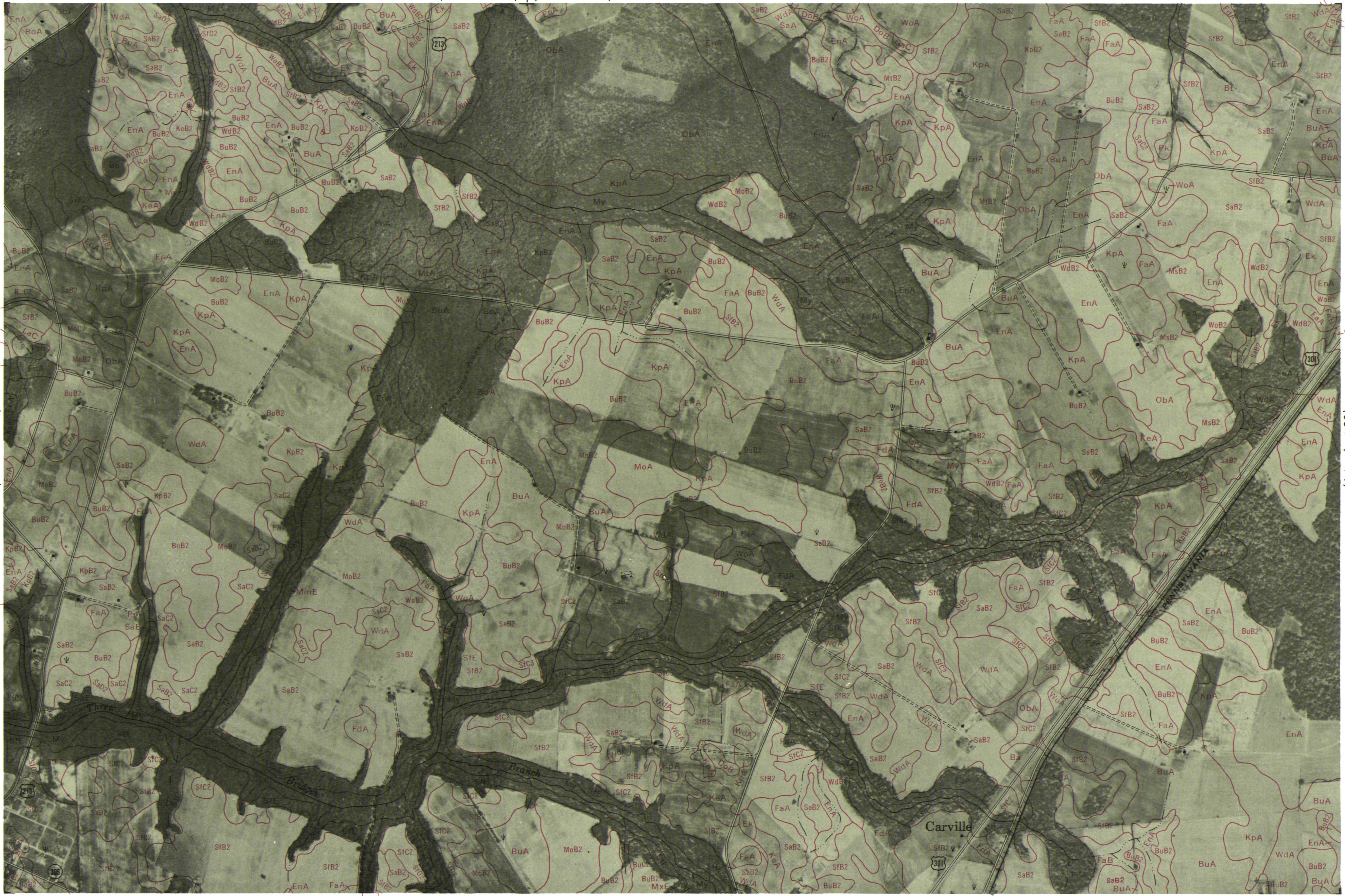
Scale 1:15 840

0 5000 Feet

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 27

(Joins sheet 21) | (Joins sheet 22)

(Joins sheet 26)



(Joins sheet 28)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 33)

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 28

(Joins sheet 22) | (Joins sheet 23)

28

(Joins sheet 27)

(Joins sheet 29)

(Joins sheet 34)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 29

(Joins sheet 23) | *(Joins sheet 24)*

29

(Joins sheet 28)

(Joins sheet 35)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

(Joins inset) QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 30

N

(Joins upper left)

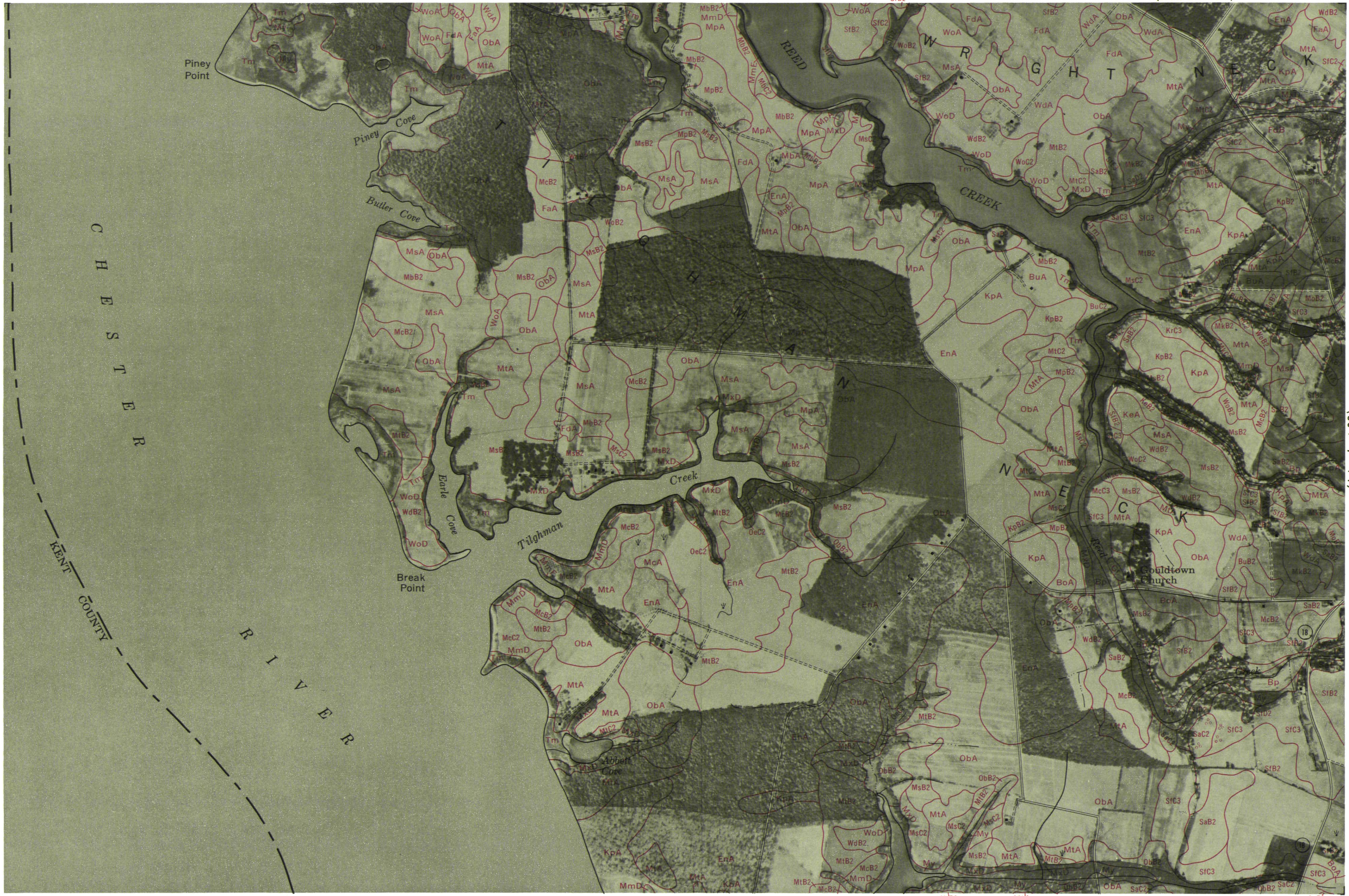
(Joins sheet 36)

0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

(Joins sheet 25)



(Joins sheet 32)

(Joins sheet 38)

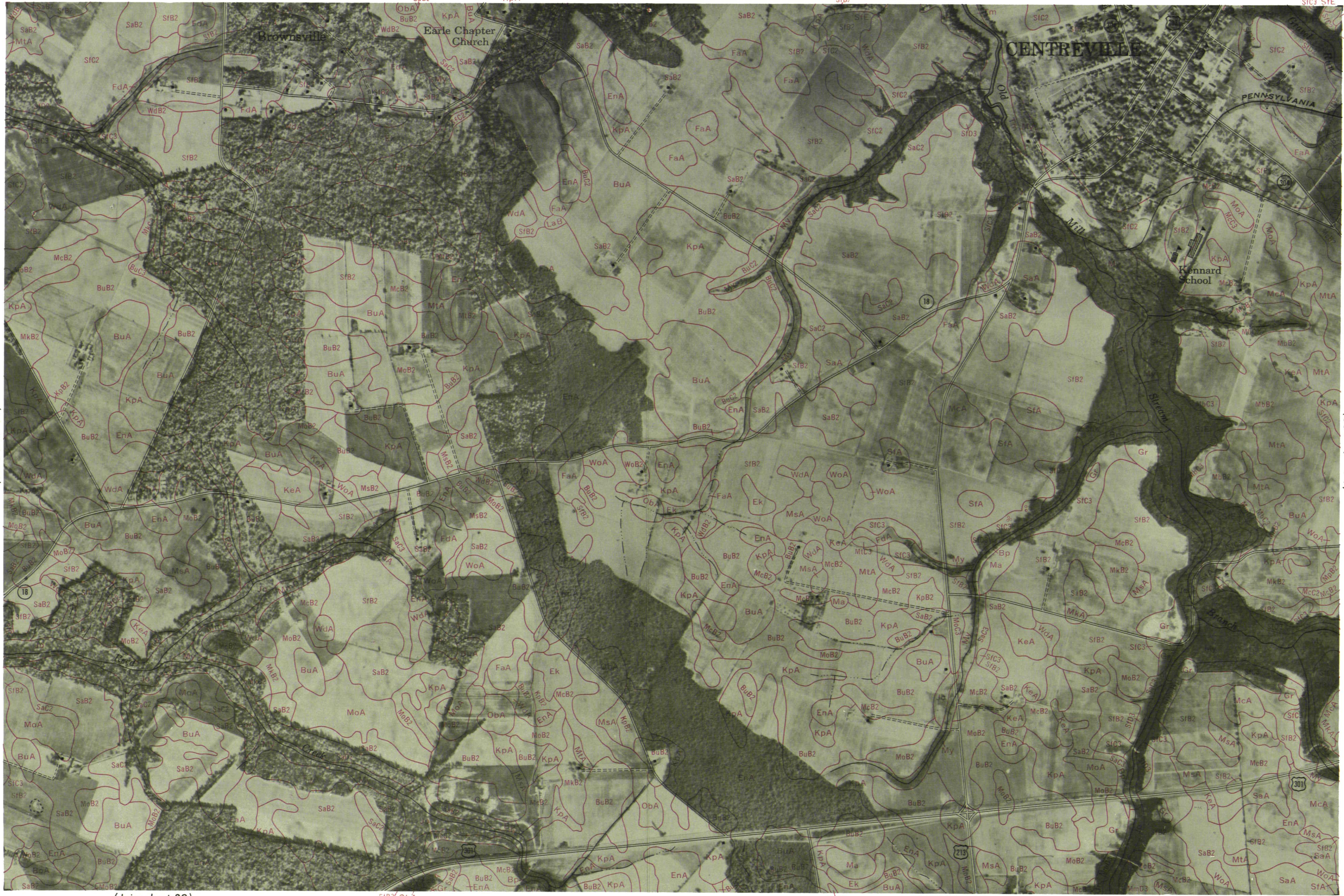
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 32

32

(Joins sheet 26)



(Joins sheet 31)

(Joins sheet 33)

(Joins sheet 39)

0 ½ 1 Mile

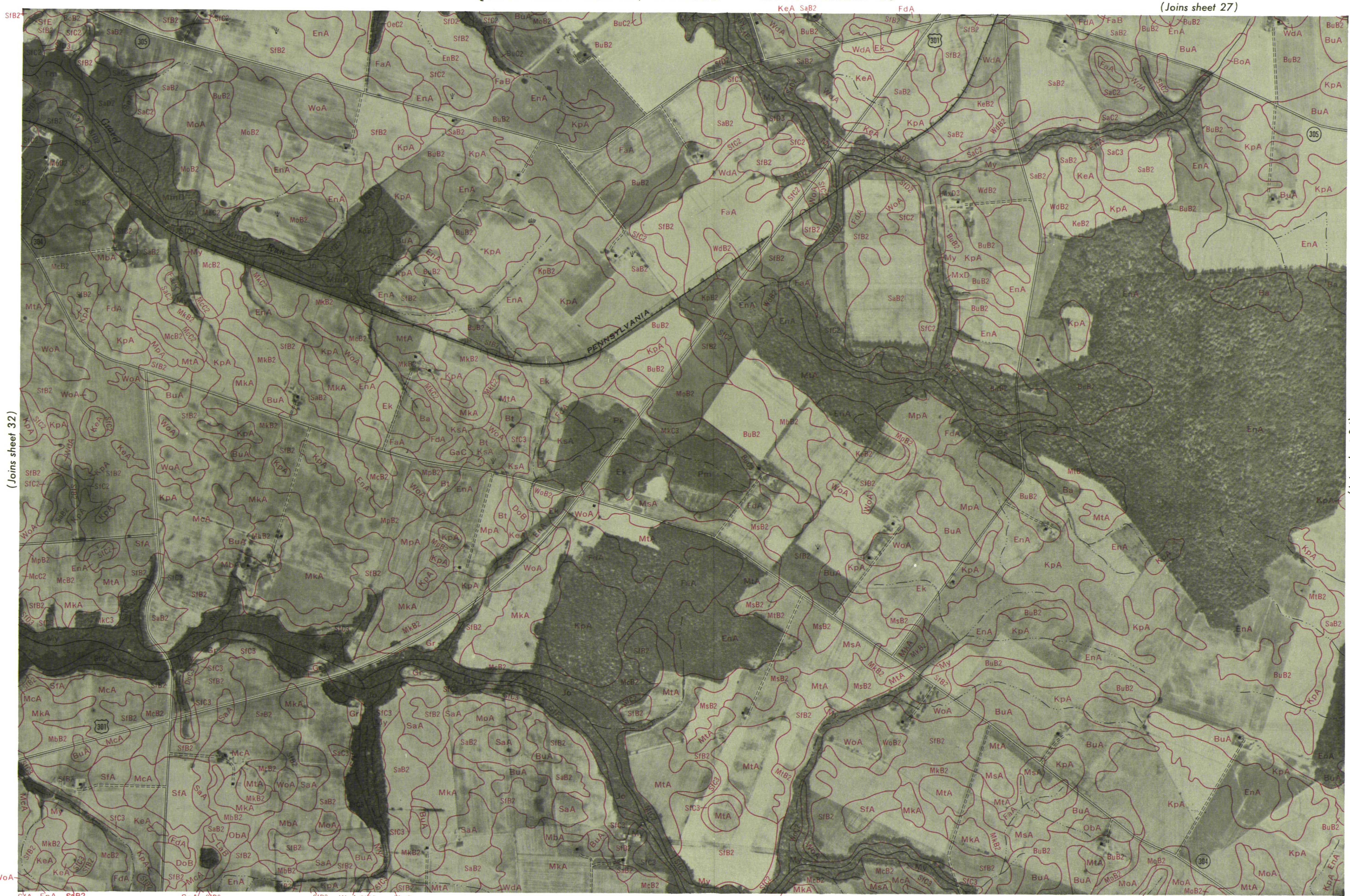
Scale 1:15 840

0 5000 Feet

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 33

33

(Joins sheet 27)



(Joins sheet 32)

(Joins sheet 34)

(Joins sheet 40)

0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

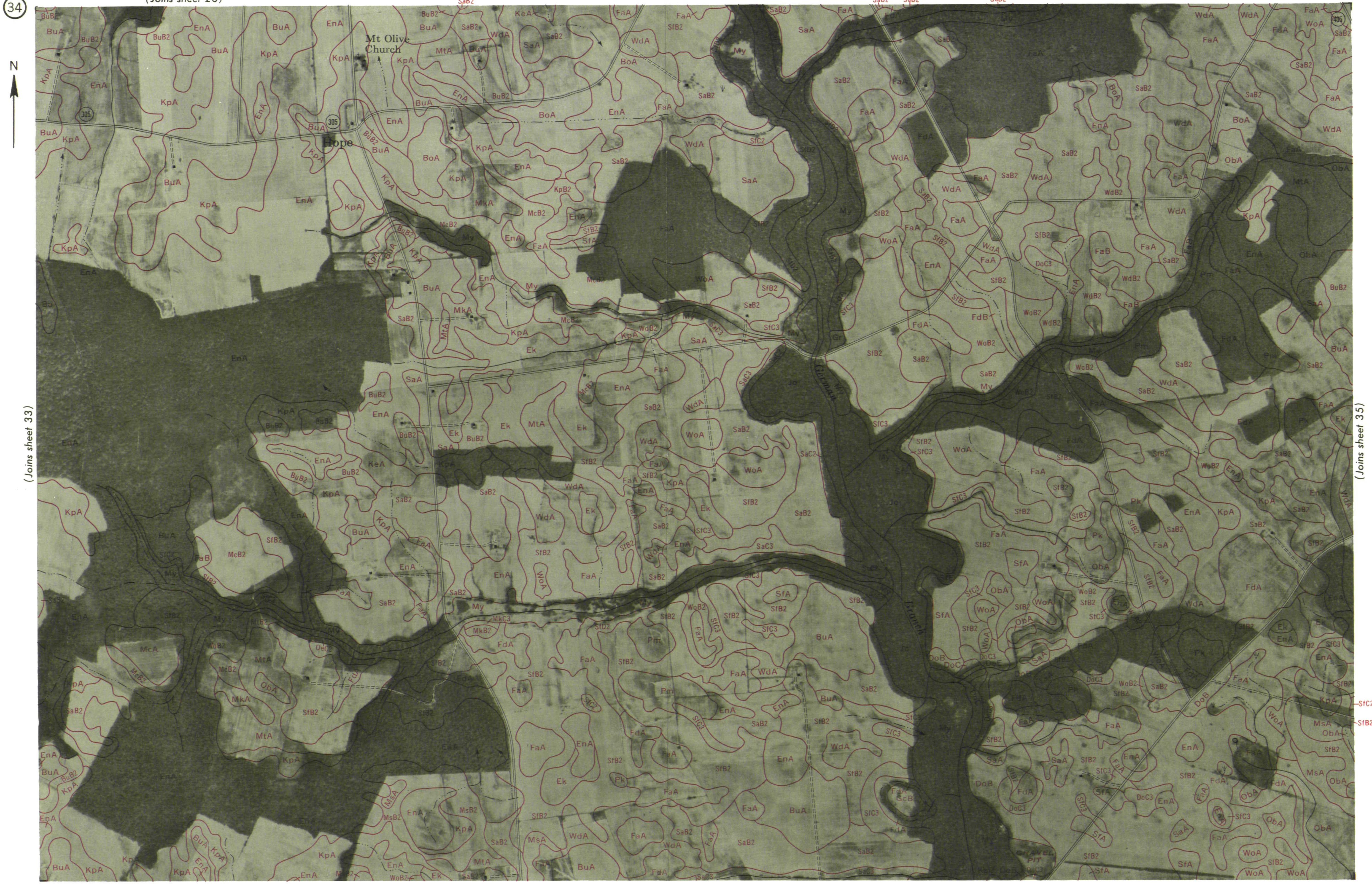
This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 34

(Joins sheet 28)

(Joins sheet 33)

(Joins sheet 35)



(Joins sheet 41)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

N

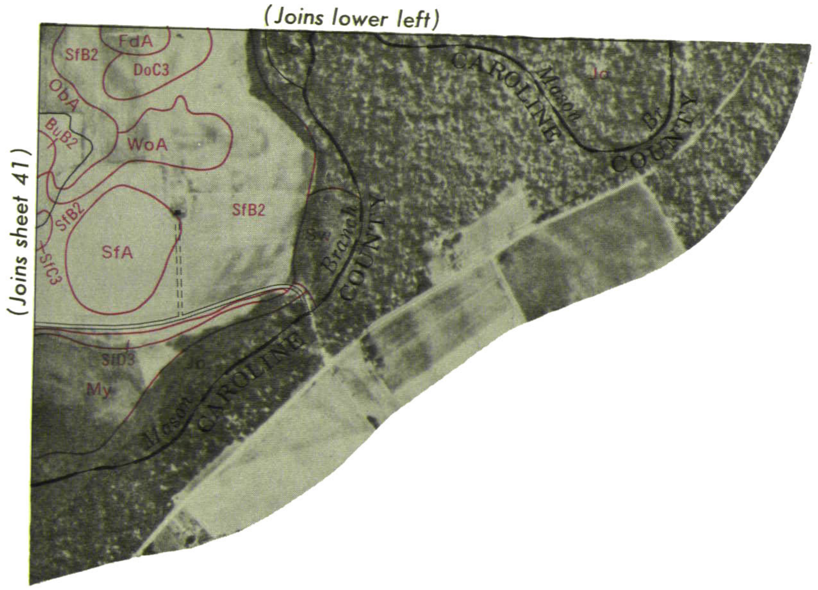
(Joins sheet 29)

(Joins sheet 34)

(Joins inset)

(Joins lower left)

(Joins sheet 41)



0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 36

(Joins sheet 30)

(Joins inset, sheet 42)

(Joins sheet 37)

(Joins sheet 43)

0 ½ 1 Mile

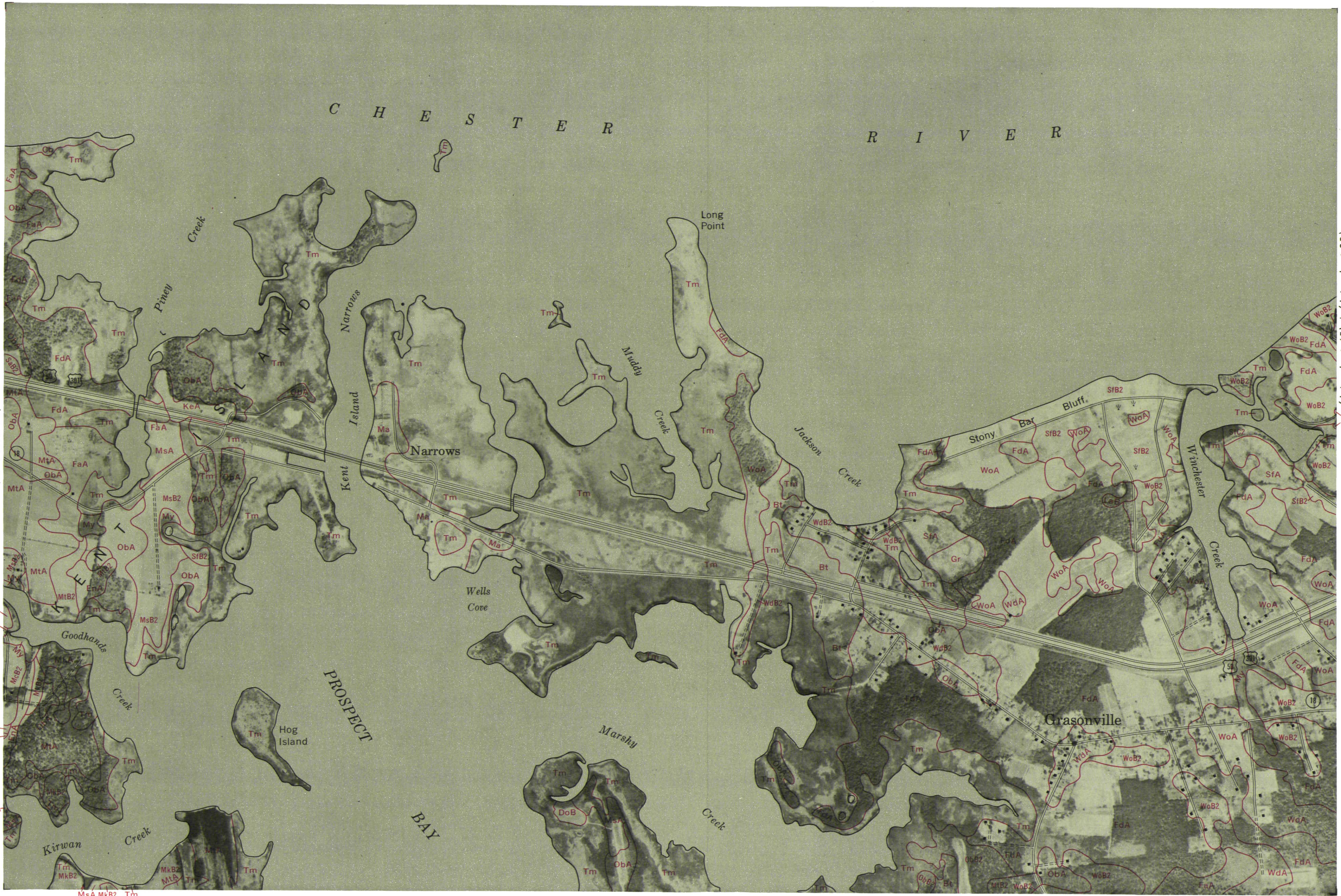
Scale 1:15 840

0 5000 Feet

N

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

(Joins sheet 36)



(Joins sheet 38) | (Joins sheet 45)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 44)

N

(Joins sheet 31)

(Joins sheet 37)

(Joins sheet 39)

(Joins sheet 45)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 39

(39)

(Joins sheet 32)

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

(Joins sheet 38)

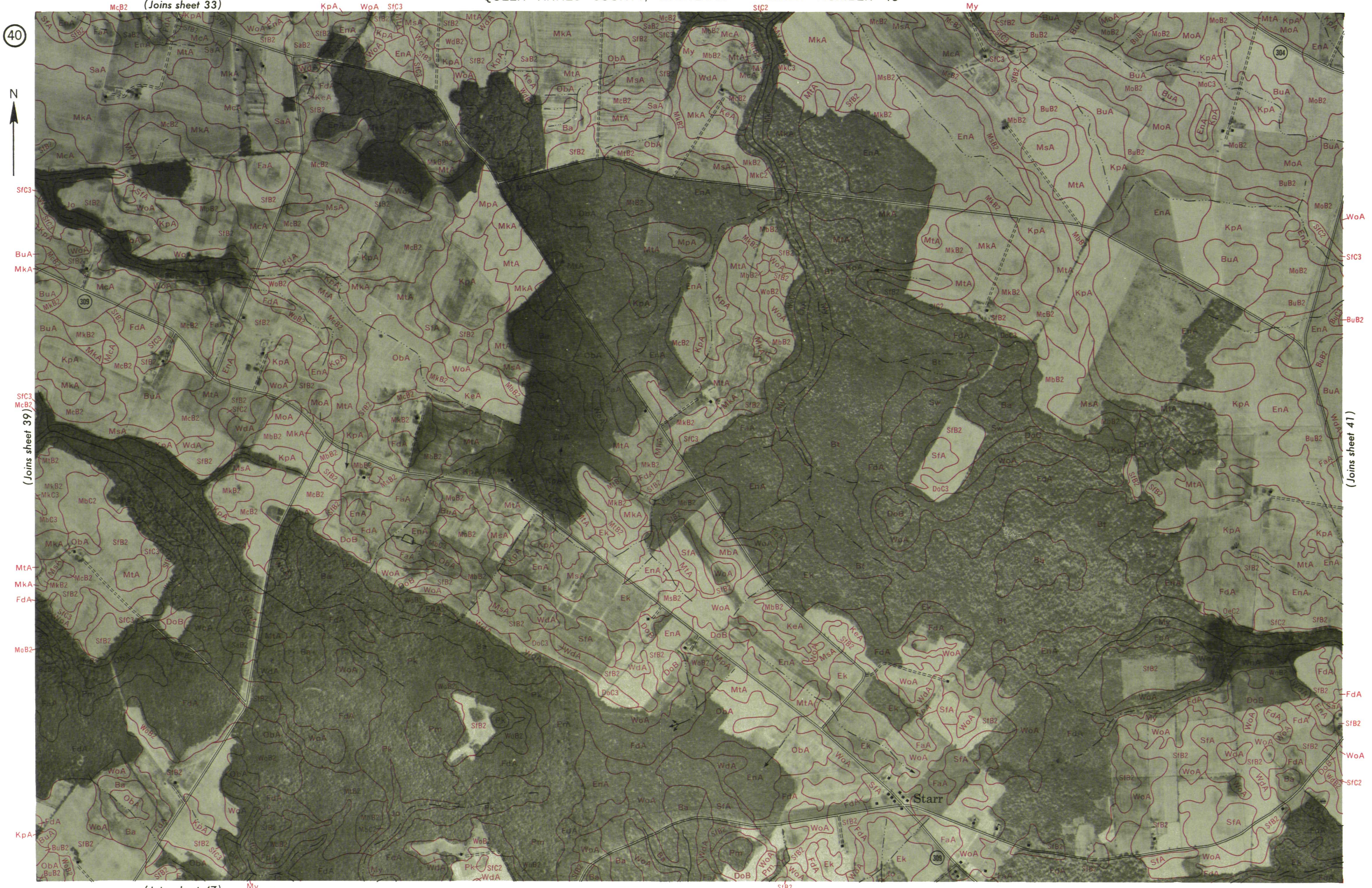
(Joins sheet 40)

(Joins sheet 46)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

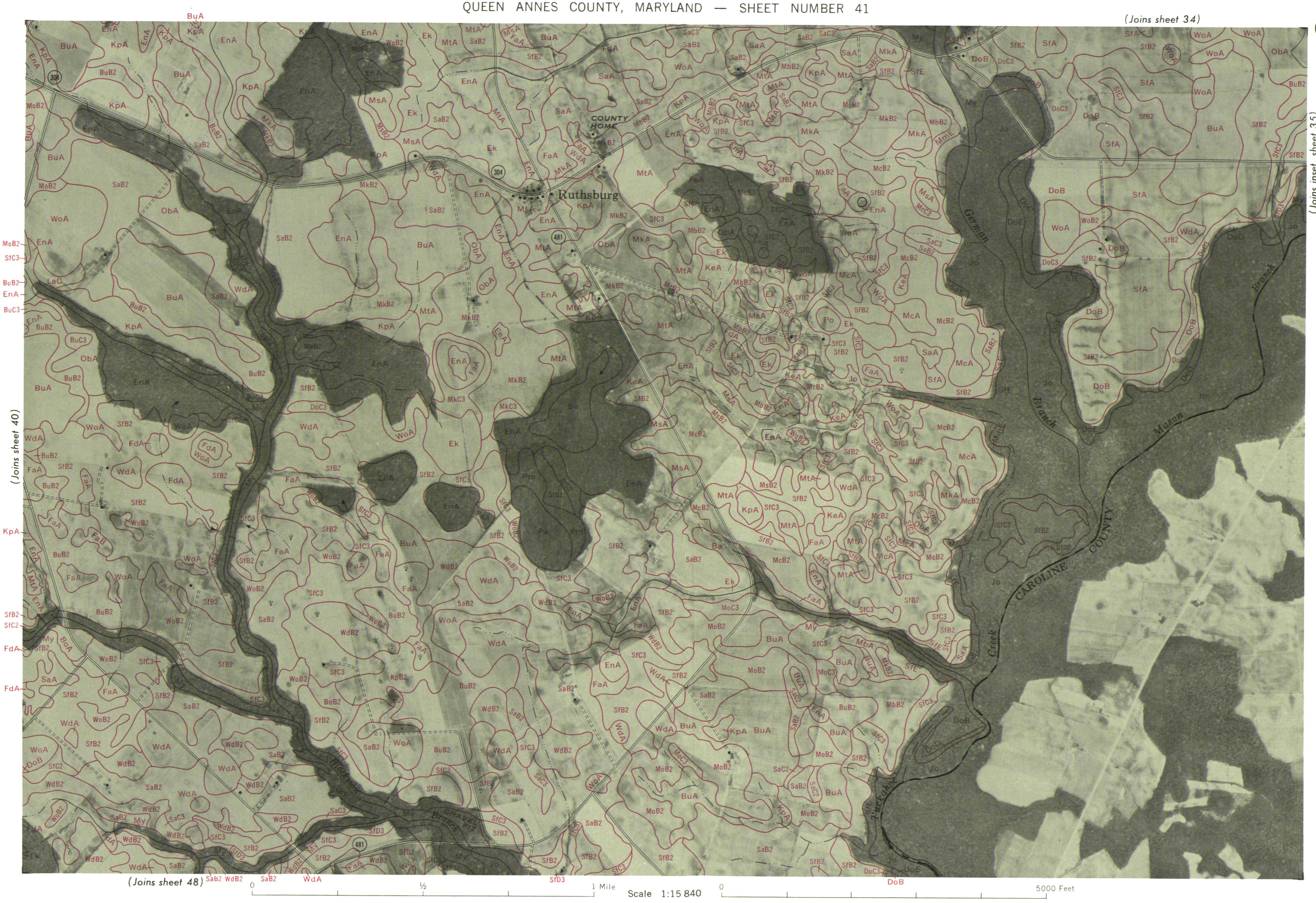
40

(Joins sheet 33)



(Joins sheet 47)

0 ½ 1 Mile
Scale 1:15 840
0 5000 Feet



This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

(Joins inset)

(Joins upper right)

(Joins sheet 49)

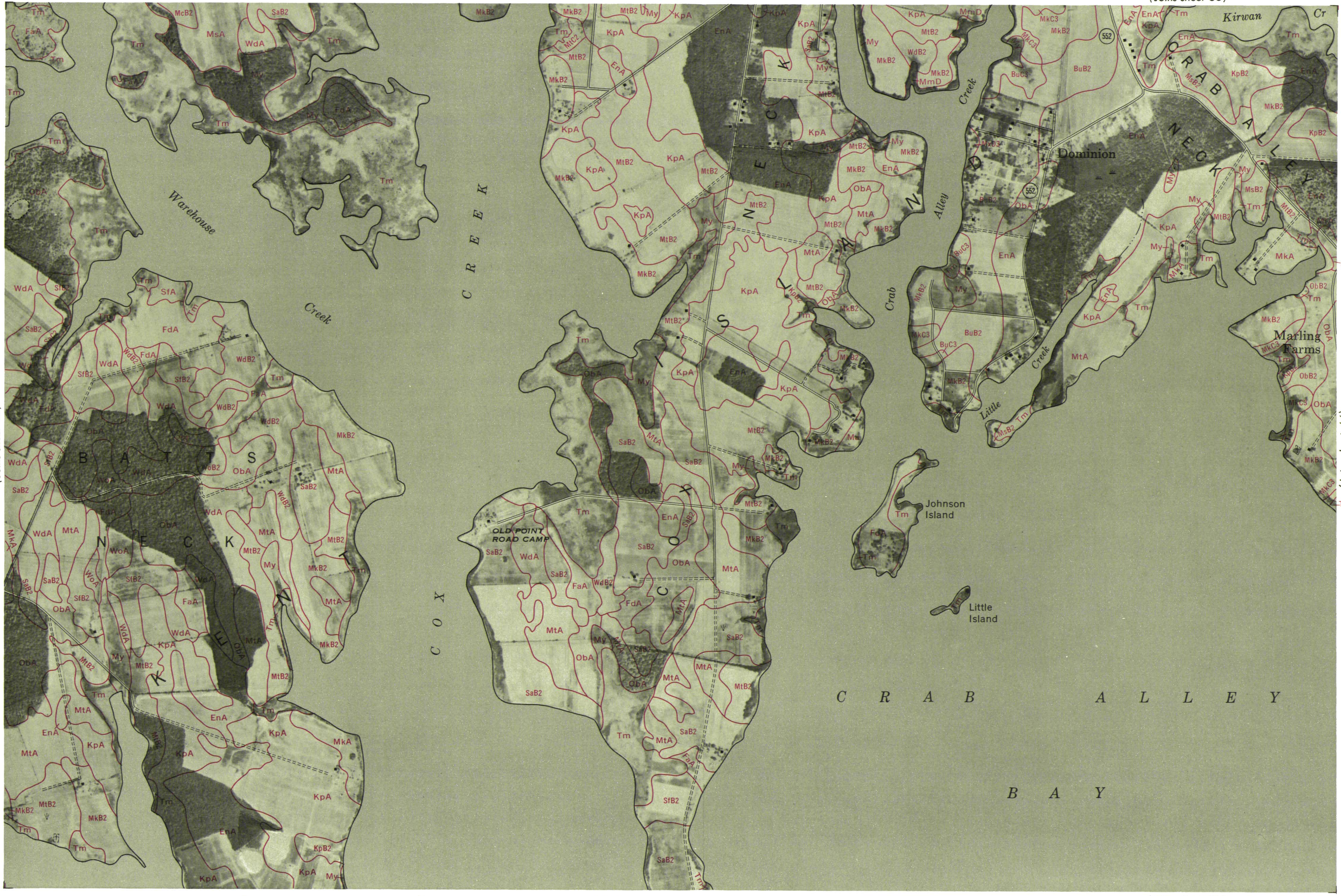
0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

(Joins sheet 36)

43



(Joins sheet 42)

(Joins sheet 44)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 50)

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

45

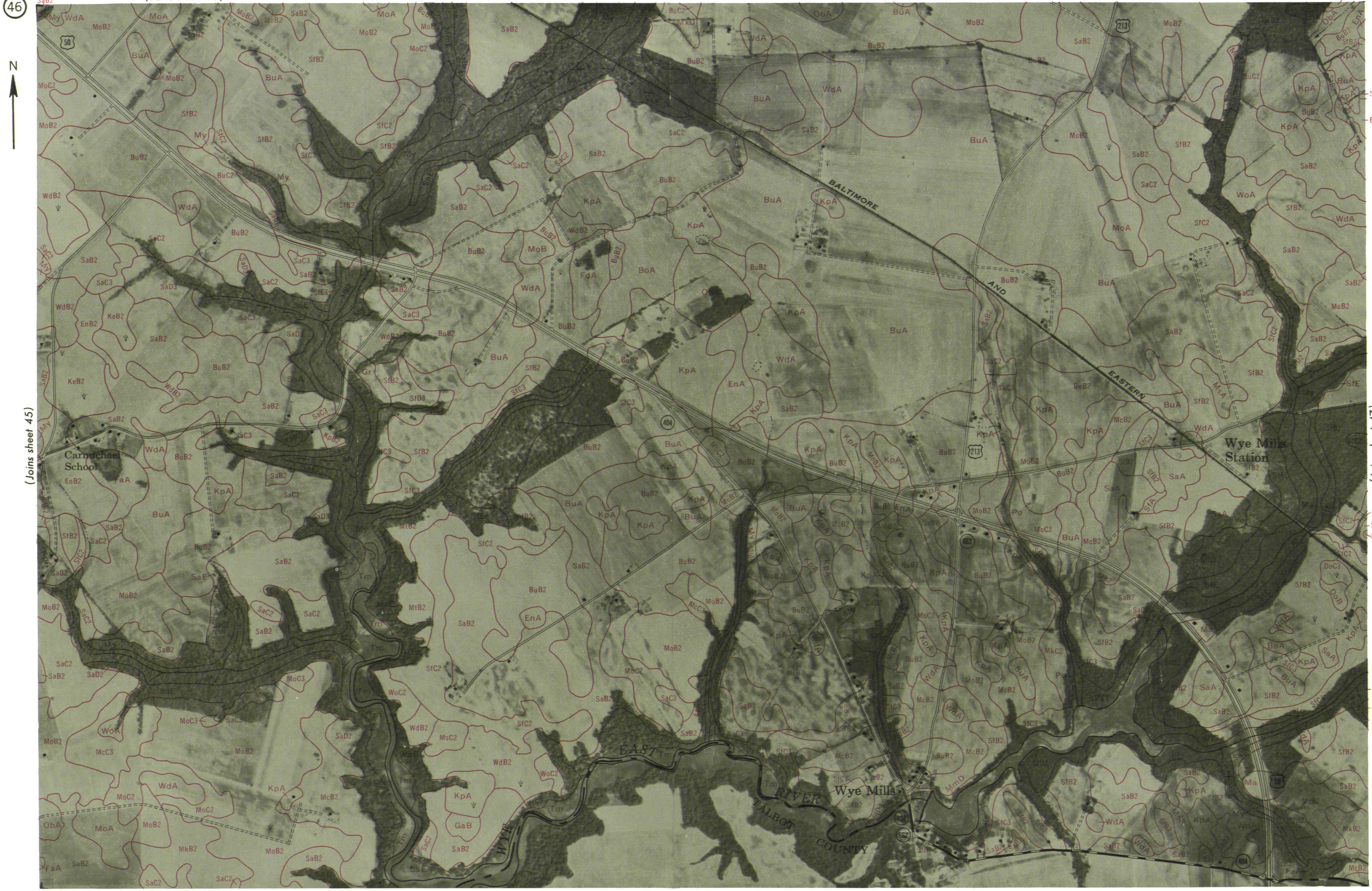
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 46

(Joins sheet 39)

(Joins sheet 45)



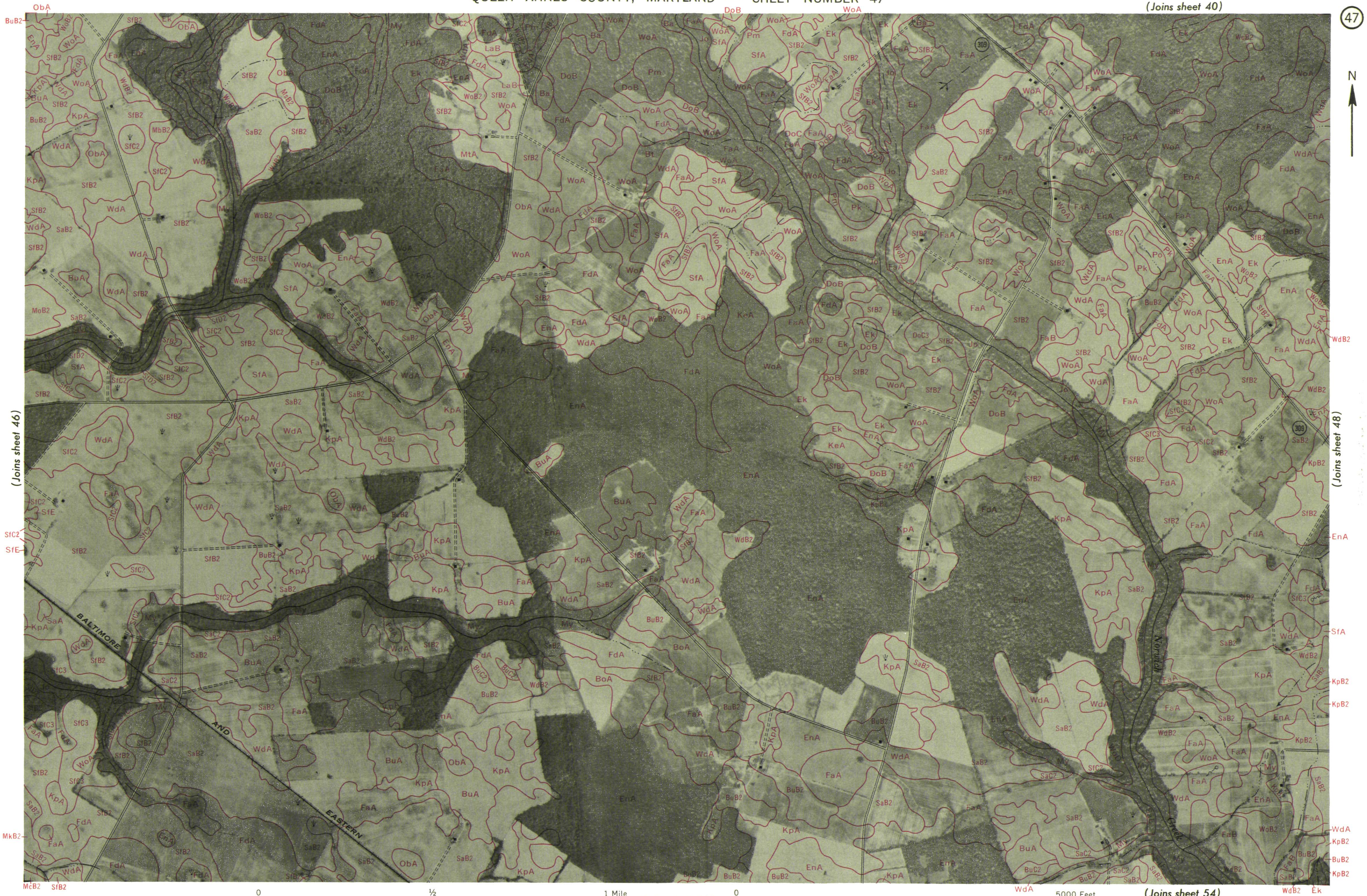
(Joins sheet 47)

(Joins sheet 53)

0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet



0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

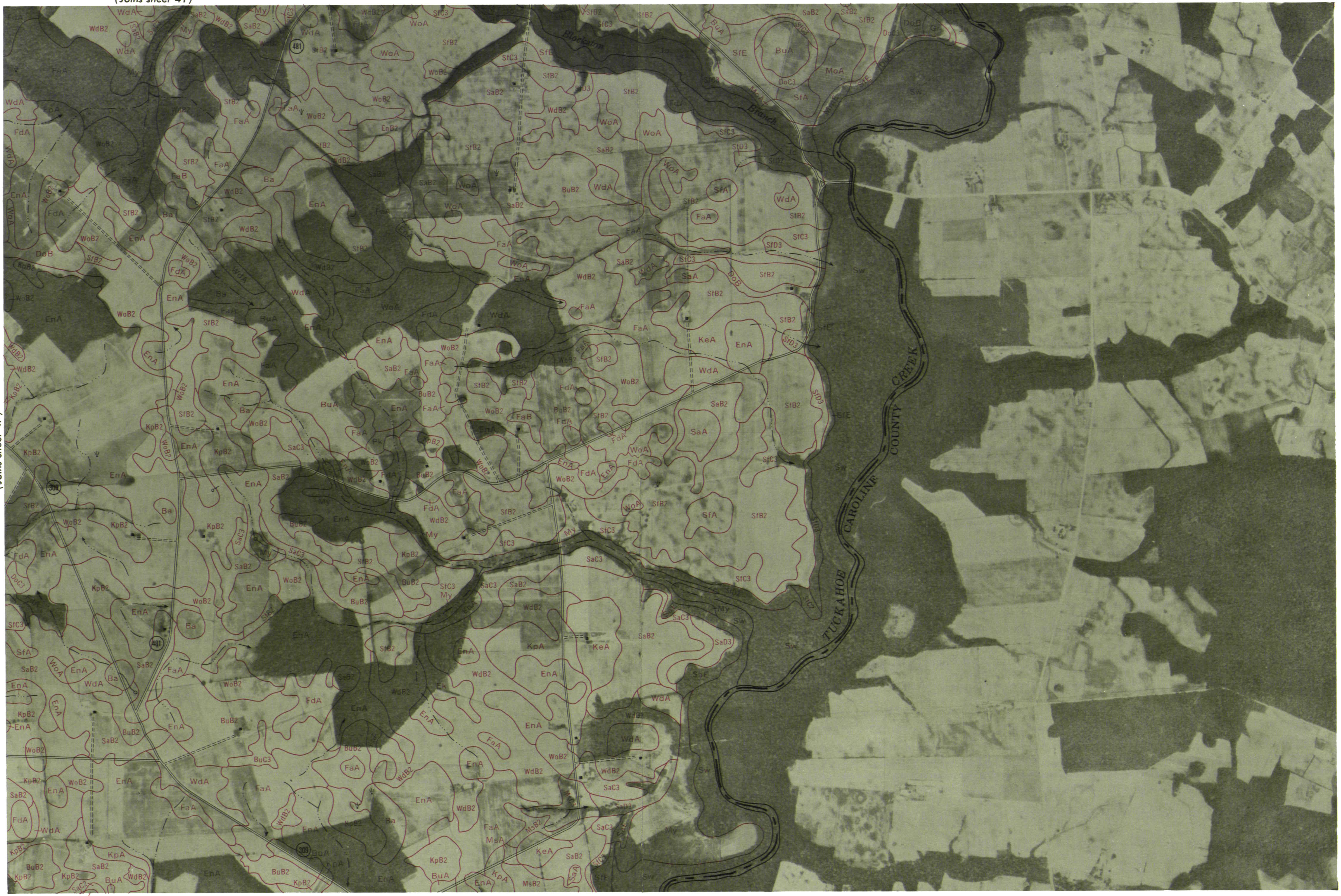
48

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 48

(Joins sheet 41)

N

(Joins sheet 47)



(Joins inset, sheet 54)

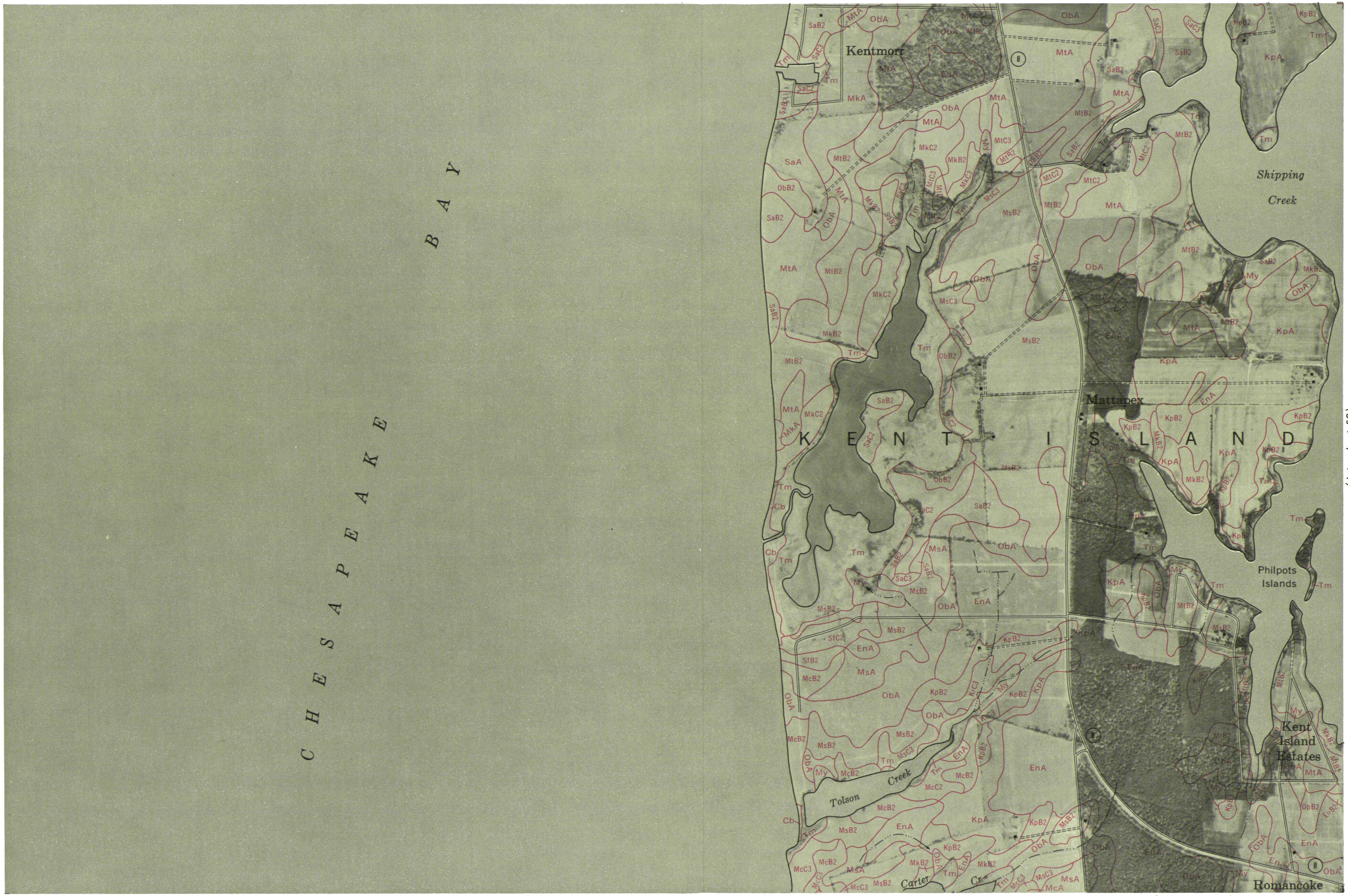
0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

(Joins sheet 42)

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.



(Joins sheet 50)

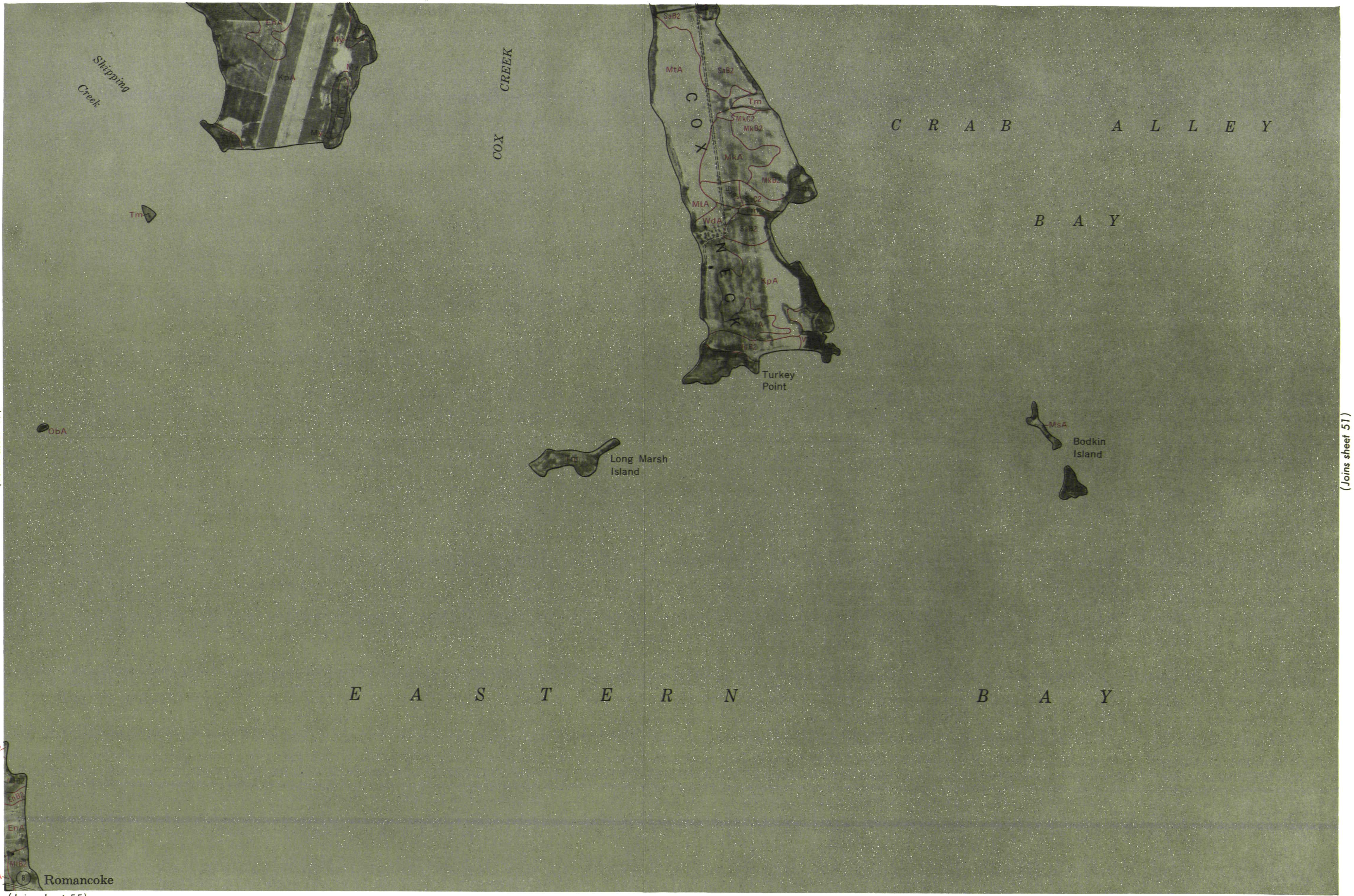
(Joins sheet 55)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

50

(Joins sheet 43)

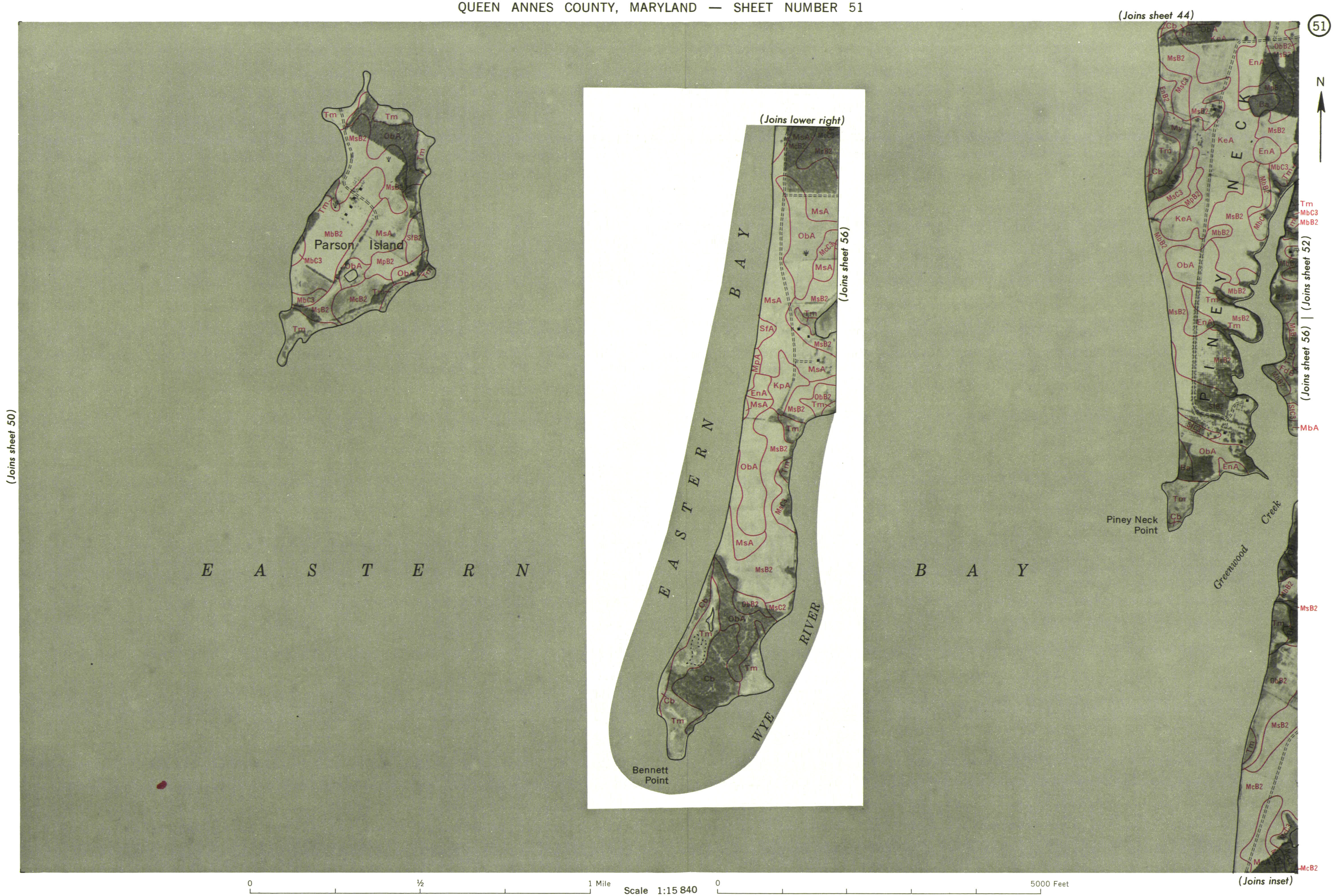
(Joins sheet 49)



(Joins sheet 51)

(Joins sheet 55)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet



Scale 1:15 840

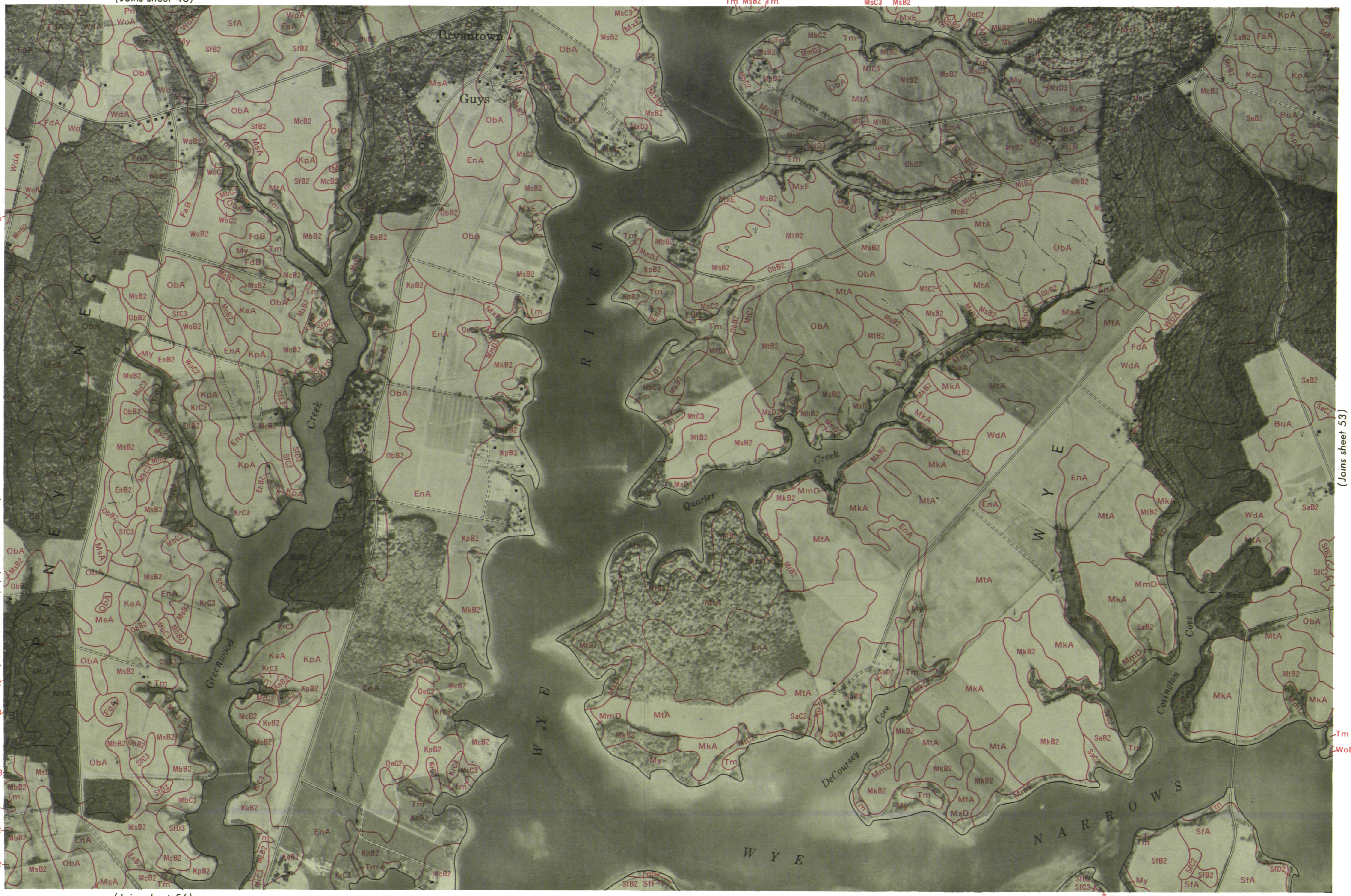
0 ½ 1 Mile

0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 52

(Joins sheet 45)

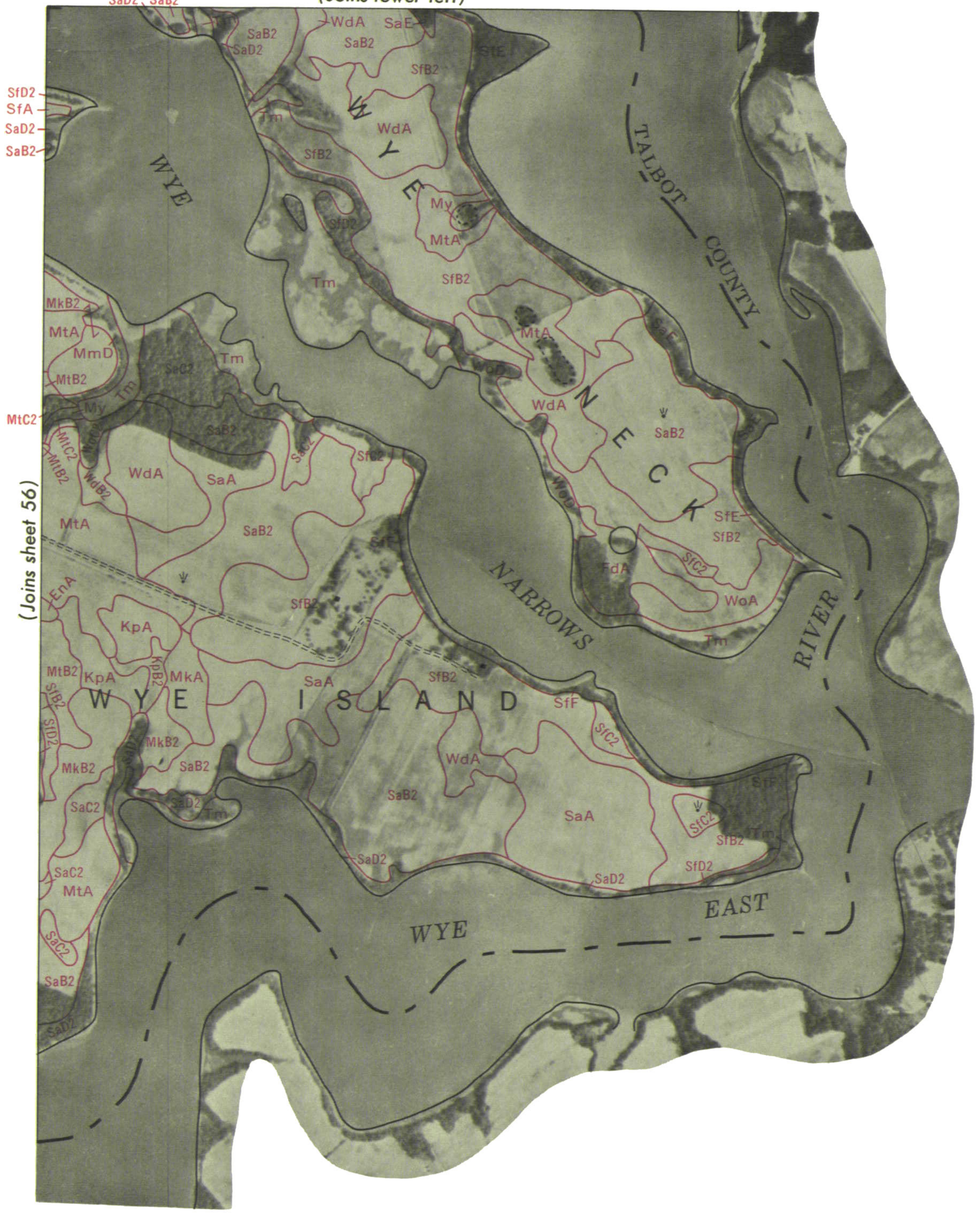


(Joins sheet 53)

(Joins sheet 51) | (Joins sheet 44)

(Joins sheet 56)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet



N

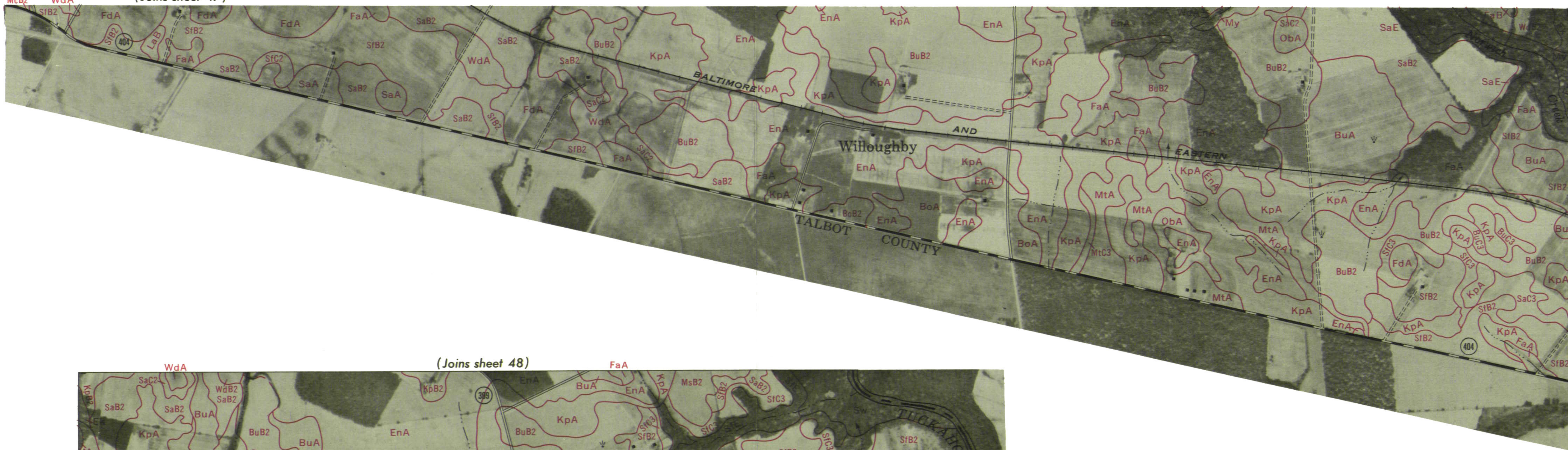
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 54

54

N



0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 49) | (Joins sheet 50)

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maryland Agricultural Experiment Station.

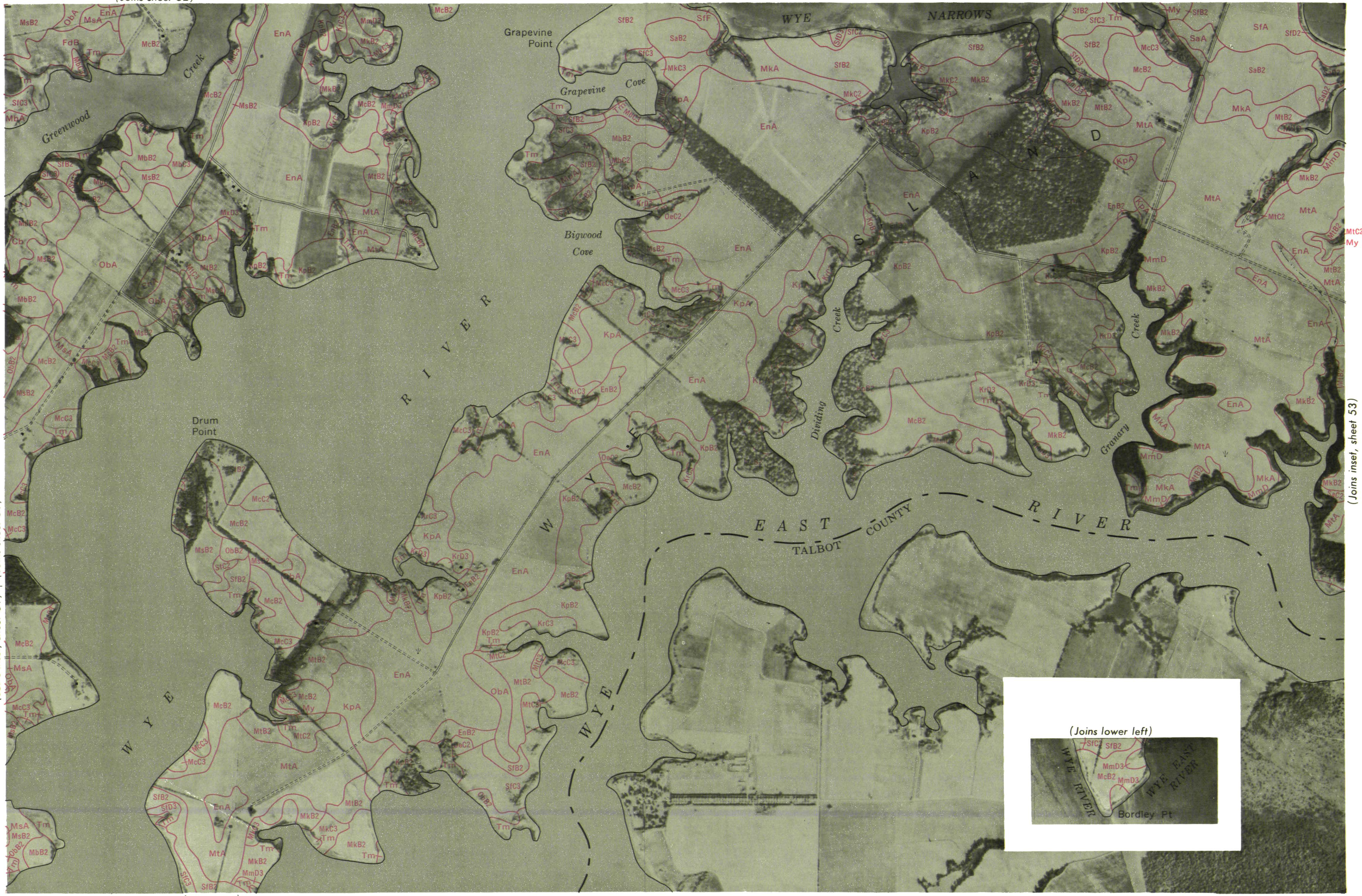
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

QUEEN ANNES COUNTY, MARYLAND — SHEET NUMBER 56

(Joins sheet 52)

N

(Joins inset, sheet 51) | (Joins sheet 51)



(Joins inset, sheet 53)

(Joins inset)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

QUEEN ANNES COUNTY, MARYLAND

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Dual
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail, foot
- Railroad
- Ferries
- Ford
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings
- School
- Church
- Station

Mines and Quarries

Mine dump

Pits, gravel or other

Power lines

Pipe lines

Cemeteries

Dams

Levees

Tanks

Oil or gas wells

BOUNDARIES

- National or state
- County
- Reservation
- Land grant

DRAINAGE

Streams
- Perennial
- Intermittent, unclass.

Canals and ditches — CANAL / DITCH

Lakes and ponds
- Perennial
- Intermittent

Wells — flowing

Springs

Marsh

Wet spot

Alluvial fan

Drainage end

RELIEF

Escarpments
- Bedrock
- Other

Prominent peaks

Depressions

	Large	Small
Crossable with tillage implements		
Not crossable with tillage implements		
Contains water most of the time		

SOIL SURVEY DATA

Soil boundary and symbol — Dx

Gravel

Stones

Rock outcrops

Chert fragments

Clay spot

Sand spot

Gumbo or scabby spot

Made land

Severely eroded spot

Blowout, wind erosion

Gullies